NASA Acquisitions Pollution Prevention Office
Kennedy Space Center, FL 32899

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Studies, Reports, and Recommendations in Support of the NASA Acquisition Pollution Prevention (AP2) Program at the John F. Kennedy Space Center (KSC), FL

Status Report #2
October 03, 2003

NASA Contract: NAS10-03029
Task Order No. 1

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Executive Summary

NASA Headquarters established the NASA Acquisition Pollution Prevention (AP2) Program Office in 1998 to help NASA Enterprises, Programs and Centers qualify and implement replacement materials or processes that reduce and eliminate the uses of hazardous materials (HazMats). As the support contractor to the AP2 Office, ITB staff provides engineering, technical and administrative program and project management support to the AP2 Program manager. This report covers ITB's performance under Task Order No. 1 for the period July 1 to September 30, 2003. The NASA AP2 Program operates in three distinct business entities:

- Agency;
- NASA / DoD;
- NASA / International

During this reporting period, ITB provided core program support across all three (3) business entities (NASA, DoD, and International). Activities included but were not limited to:
Efforts required to complete appropriate research, program and project development;

- Analyses, risk and quality assessments;
- Strategic planning;
- Customer relations and Outreach; and
- Information management and website support and maintenance.

In support of the Agency Business, ITB initiated the following five NASA P2 projects for execution:

- Validation of non-ozone depleting cleaning system for on-aircraft flushing of T-38 oxygen lines at NASA JSC;
- Validation of non-ozone depleting cleaning system for in-place cleaning of gaseous oxygen cleaning carts across NASA;
- Identification, testing and validation of alternatives to Aliphatic Isocyanate Urethanes on carbon steel structural elements across NASA (Test Stands, Shuttle Support etc.);
- Identification, testing and validation of low-emission surface preparation/depainting technologies for carbon steel structural elements across NASA (Test Stands, Shuttle Support etc.);
- and Identification, testing, and validation of chrome-free conversion coatings for NASA Shuttle Elements (SEA collaborative study).

In support of the DoD Business Entity, ITB provided significant support to the Joint Group on Pollution Prevention (JG-PP) in its efforts to maintain environmental technology cooperation, and qualify shared alternative material and process solutions that are less or non-hazardous to the environment. A major effort was the completion of the Technical Phase of the JG-PP Lead-Free Solder project and preparing for testing. A subcontract is expected to soon be awarded for procurement of testing materials and execution of the mechanical shock and lead-residue testing. ITB provided other support to JG-PP by helping identify potential new projects and developing an earned value management metric approach for JG-PP Projects.

In support of the International Business Entity, ITB continued to support the Portuguese Institute of Environment and Centro Para Prevenção da Poluição – C3P (English translation: Center for Pollution Prevention) under the NASA/Portugal Joint Statement (JS) and the Terms of Reference (TOR). Of significance was ITB's assessment visits to 24 painting and metal works facilities in Portugal by Engineers Rothgeb and Andrews in late June and early July. An Assessment Report was developed to identify potential pollution prevention (P2) project opportunities between NASA and Portugal. The common assessment findings of mutual interests to NASA and Portugal were presented at the C3P/NASA Technical Workshop on 09/19/03. In addition, Mr. Hill and Ms. Hill provided significant support for the following scheduled events: Protocol Signing, 09/18/03, C3P/NASA Technical Workshop, 09/19/03, and the Joint Oversight Group Meeting (JOG), 09/22/03. These activities resulted in identification of four (4) specific P2 projects.

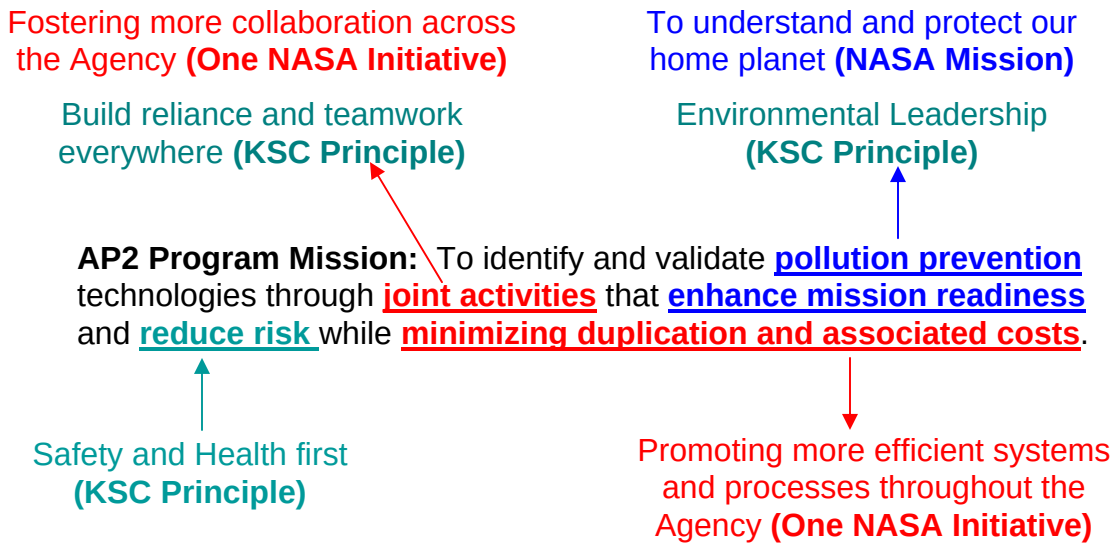
The following Status Report provides detailed information regarding all activities supported by ITB during this period of performance.

Status Report

This Status Report for the NASA AP2 Program covers the period July 1, 2003 through September 30, 2003. The report is divided into four major sections:

1. Core Program Support;
2. Agency Business Entity;
3. DoD Business Entity; and
4. International Business Entity Support.

The AP2 Program mission directly relates to the NASA mission, the One NASA Initiative, and Kennedy Space Center (KSC) Principles by focusing on collaboration between centers in identifying and testing more environmentally friendly technologies.



In enacting its mission, the NASA AP2 Program operates in three distinct business entities:

- Agency;
- NASA / DoD; and
- NASA / International

The AP2 Office provides engineering, technical and administrative program and project management support. Projects may be exclusive to each business entity or shared by two or more in keeping with the Program's mission to identify common environmental issues and work collectively to find solutions that reduce duplication of effort, costs and technical risks.

A. Core Program Support

Core program support activities are shared across and benefit program business entities (NASA, DoD, International). Activities include but are not limited to:

- Efforts required to complete appropriate research, program and project development;
- Analyses, risk and quality assessments;
- Strategic planning;
- Customer relations and Outreach; and
- Information management and website support and maintenance.

1. Staff

The knowledge, skills, and abilities of the ITB contractors supporting the NASA AP2 Office allows the Program to meet its mission of helping NASA Enterprises, Programs and Centers qualify and implement less-HazMats or processes. The goal of achieving 7.8 full-time equivalent (FTE) contractors for this reporting period was met with the hiring of a full-time engineer. The NASA AP2 Office is now actively supported by the following personnel: Mr. Robert Hill, Program Manager; Mr. Brian Greene, Principal Senior Engineer; Mr. Kevin Andrews, Senior Engineer; Mr. Kurt Kessel, Senior Engineer; Mr. Matt Rothgeb, Journeyman Engineer; Ms. Pattie Lewis, Engineer; Ms. Tess Hill, Program Analyst/Coordinator; and Ms. Cassandra Carroll, Web/Database and Administrative Specialist. These personnel interfaced with senior NASA and DoD program and technical representatives, international executives, scientist, engineers, and numerous subject matter experts in day-to-day development of program and project requirements and activities.

2. Regulatory Support

ITB provided regulatory support this period by reviewing applicable regulations, Executive Orders, NASA guides and handbooks and international policies. ITB met its two regulatory support goals this reporting period as required by the NASA AP2 Program Manager.

1. To identify clear drivers for Agency P2 opportunities and
2. To monitor Shuttle Environmental Assurance (SEA) reporting of domestic environmental rules and regulatory impacts.

As environmental regulations continue to change, ITB will monitor national and regional regulations for any new, updated or altered environmental laws that may affect NASA operations.

Through participation in monthly teleconferences, ITB also monitored the SEA's reporting of domestic environmental rules and regulatory impacts. On 08/11/03, Mr. Rothgeb began updating Project Summary Plans to include regulatory information relating to each project. Additionally, at this time, Mr. Rothgeb began a review of new regulations and a method for monitoring changes to the regulatory structure as it affects NASA over time. This will help keep the AP2 Office knowledgeable in changes of the environmental policy of the United States thus providing resource information to stakeholders of all projects.

On 08/28/03, Mr. Rothgeb reviewed the Columbia Accident Investigation Board (CAIB) report for any recommendations particularly relevant to P2 matters. Those identified are:

1. External Tank Foam and Relating Operations

Recommendation: 3.2-1 (Page 55)
Initiate an aggressive program to eliminate all External Tank Thermal Protection System debris shedding at the source with particular emphasis on the region where the bipod struts attaches to the External Tank.

NASA AP2 Office Suggested Assistance:
The NASA AP2 needs to be involved in the information exchange of ongoing operations and related changes that will be taking place relating to External Tank processing in order for our office to determine if any assistance can be given to those efforts.

2. Reinforced Carbon-Carbon Penetrations Due to Zinc Oxide Contamination

Recommendations: R3.3-5 (Page 59)
Improve the maintenance of launch pad structures to minimize the leaching of zinc primer onto Reinforced Carbon-Carbon components.

NASA AP2 Office Suggested Assistance:
The NASA AP2 Office is currently working with personnel at KSC and other Centers on alternative coatings projects. Identified in a teleconference dealing with coatings and depainting, "Identification and validation of alternatives to inorganic zinc primers in moderately and highly corrosive environments" was listed as the first proposed project area for this group.

The NASA AP2 Office is currently working within NASA on related coating/depainting projects and is willing to extend this effort to examine viable alternatives to inorganic zinc primers for the launch support structures at KSC.

3. Kapton Wiring

Recommendations: R4.2-2 (Page 89)
As part of the Shuttle Service Life Extension Program and potential 40-year service life, develop a state-of-the-art means to inspect all Orbiter wiring, including that which is inaccessible.

NASA AP2 Office Suggested Assistance:
The NASA AP2 Office is currently in contact with various DoD entities and can assist with any projects that may be developing that deal with finding, testing or demonstrating alternatives to Kapton wiring or the assembly/maintenance of these wiring systems. Since aromatic polyimide insulation has been banned for use in most aircraft, alternatives likely already exist. Considering that the Board recommends that all wiring be inspected, this would also lead to the capability to replace wiring with such an alternative should it be identified and validated for use on the Shuttle.

4. Auxiliary Power Units

Recommendations:
None Given

Notes from Section 9.1: "Near Term: Return to Flight:" (Page 208)
"The recognition of human space flight as a developmental activity requires a shift in focus from operations and meeting schedules to a concern for the risks involved.

Necessary measures include:
Identifying risks by looking relentlessly for the next eroding O-ring, the next falling foam; obtaining better data, analyzing and spotting trends"

NASA AP2 Office Suggested Assistance:
The NASA AP2 Office has been in contact with personnel that have been researching alternatives to hydrazine based APUs both within and exterior to NASA. SRB has moved from hydrazine based APUs to hydrogen based because of the risk involved with hydrazine. A project now entitled "Orbiter Advanced Hydraulic Power Systems" has been ongoing in a search for this alternative but has slowed in recent years due to funding and interest. The NASA AP2 Office is capable of working with the entities within NASA and the DoD to determine if an alternative can be identified and implemented to reduce risk during space flight.

5. Deteriorating Shuttle Infrastructure

Recommendations: None

Notes from Section 5.5: "When to Replace the Space Shuttle: Deteriorating Shuttle Infrastructure" (Page 114)

The same ambiguity about investing in Shuttle upgrades has also affected the maintenance of Shuttle Program ground infrastructure, much of which dates to Project Apollo and 1970s Shuttle Program construction." ... "Most ground infrastructure was not build for such a protracted lifespan. Maintaining infrastructure has been particularly difficult at Kennedy Space Center, where it is constantly exposed to a salt water environment." ... "In 2000, NASA identified 100 infrastructure items that demanded immediate attention."

NASA AP2 Office Suggested Assistance:
The NASA AP2 Office can assist in identifying processes, materials and methods to be used during refurbishment operations of infrastructure that will best suit NASA's needs, taking into consideration the costs of such operations. The NASA AP2 Office has already begun or proposed several projects that directly relate to the infrastructure of NASA Centers.

The resulting recommendations of this report serve as a driver for changes to both flight and non-flight systems within NASA. Mr. Rothgeb sent his comments to Ms. Christina Brown, NASA AP2 Program Manager, for review as was requested by NASA HQ. The review of this document will help identify how the AP2 Office may be able to participate in any changes to NASA operations or new projects that result from the accident investigation. On 09/02/03, Ms. Brown forwarded report to Richard Wickman.

As a follow-up to Mr. Rothgeb's comments on the CAIB report, Mr. Andrews contacted the technical team members on the AP2 Coating and Depainting project to assess their interest in developing a P2 project to identify solutions to the problem of zinc leaching from the zinc primer used on NASA KSC launch structures. Leached zinc is thought to run onto the leading edge of the Orbiter's wings causing pinholes in the Reinforced Carbon-Carbon panels. The August 2003 CAIB report determined that this pathway "increases the opportunities for localized oxidation" and KSC needed to "improve the maintenance of launch pad structures to minimize the leaching of zinc primer onto Reinforced Carbon-Carbon components." One of the AP2 projects identified early on was the identification, testing and validation of alternatives to inorganic zinc primers in moderately and highly corrosive environments. The response to reconsidering this project idea as a higher priority was greeted warmly by several project representatives.

3. Business and Financial Plan Development

ITB provided business and financial plans for the administrative contract support of the NASA AP2 Program Office. The methodology and business systems used by the AP2 Program

assure cohesion of technical and business applications providing quality products and services, delivered on time and within budget. During this period, ITB continued to:

- Track travel and materials budgets for proper program supportability;
- Fully provide office supplies; and
- Support and identify office equipment (printers and fax) operation capability - with no down time.

Ms. Hill requested the following for the new hire, Ms. Pattie Lewis:

- July 7, 2003 - temporary badge, monitor, CPU, and TSR for phone;
- July 10, 2003 - picture badge and email account;
- July 24, 2003 – Lamacoid and office key.

As of September 2, 2003, all requests are complete. Ms. Lewis is fully operational.

4. Status Reports and Schedules

ITB routinely prepares presentations and status reports with the goal of sustaining high quality and timely performance. During this period, ITB

- Maintained a master schedule of program activities;
- Maintained appropriate documentation and record keeping, e.g. calendars, meeting agendas, minutes, and action tracking; and
- Prepared draft presentations and maintained a presentation library.

The following paragraphs provide further details of these activities.

The Calendar of Events tool includes NASA, DoD and International program and project teleconferences, meetings and conferences and other events involving the NASA AP2 Program Office. To ensure the calendar is always current, event updates and data calls were requested and updated by Ms. Hill twice a month, on the following dates:

Updated	Data Call
July 3, 2003	July 15, 2003
July 25, 2003	July 30, 2003
August 7, 2003	August 18, 2003
August 19, 2003	August 25, 2003
September 1, 2003	September 8, 2003
September 11, 2003	

During the reporting period, the following events were identified:

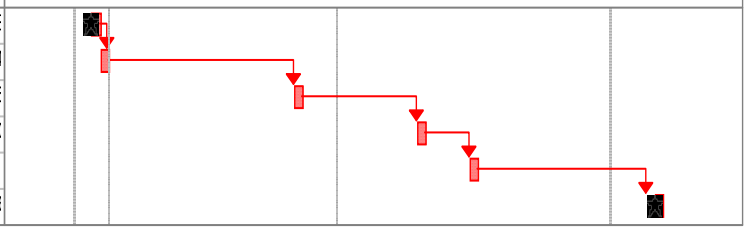
Entity	Teleconferences	Meetings	Conferences/Workshops
NASA AP2	12	10	2
JG-PP	8	5	2
C3P	2	5	1
SEA	1	2	

The Calendar is available upon request for specific dates of events, telecomm, meetings, etc. The Program and Project events are noted on the NASA AP2 web site.

On 09/04/03, Ms. Hill prepared a project schedule for the KSC Environmental Council Meeting scheduled for November 6, 2003. Mr. Greene and Ms. Lewis prepared a first draft of the PowerPoint slides and hand-delivered them to Ms. Brown on 09/10/03 for her review and

comment. Comments and changes were incorporated and revised draft slides were completed on 09/19/03. ITB prepared a point paper summarizing Ms. Brown's presentation and delivered it on 09/24/03. Below is the projected schedule:

ID	Task Name	Start
1	EC Meeting Notice	Wed 9/3
2	2002 EC Briefing Forwarded to C	Thu 9/4
3	Point Paper(Suggestions) Due to	Fri 9/26
4	PPT due	Fri 10/1(
5	Dry Run	Thu 10/1
6	EC Meeting	Thu 11/(



5. Program Information Management Systems

ITB maintained various information management systems during this reporting period, including a Document Control System (DCS), an action item tracking tool, calendar of events, and other tools to track and integrate business and technical activities. The tools help track and integrate business and technical activities in all business entities.

The Document Control System was initially conceived to provide a mechanism to allow the NASA AP2 Program to track and monitor generation of documents and briefing packages and to serve as a repository for critical operational and contractual documents. As a tool, DCS reduces duplication of effort in the generation, storage and management of significant documents and ensures that these are coded and stored systematically.

The DCS is managed by a Control Administrator. In this capacity, the administrator maintains and updates a document repository with documents provided by the NASA AP2 support staff as per the DCS guidelines.

The DCS and the document repository is currently located on the computer hard drive of the NASA AP2 Program contractor supported Web/Database and Administrative Specialist. As per the guidelines of the DCS, all stored documents will be backed-up periodically.

During this reporting period, Mr. Rothgeb completed development of the DCS database in Microsoft Access using the default programming system as well as coding and debugging several portions of the database manually. The database was designed with flexibility in mind—it can eventually be upgraded with a web-enabling program language for use on a server and be available to all NASA AP2 Program personnel on-line once the server is authorized by the NASA AP2 Program Manager and procured. Because of the NASA firewall issues experienced with the NASA AP2 Web Site, ITB recommends that the DCS be located on a server at ITB South Office in the future.

On 08/11/03, the ITB contractor support staff assigned to the NASA AP2 Program began providing electronic copies of properly coded NASA AP2 documents to Ms. Carroll for inclusion in DCS. As of 09/22/03, ITB staff had submitted nineteen (19) documents for entry into the DCS. The total number of records now stored in the DCS is twenty-four (24). ITB plans to improve the DCS within the next reporting period by adding a hyperlink to each record's document for instant viewing of the document.

6. Web Sites

During this reporting period, Ms. Carroll maintained and updated the NASA AP2 web site as needed. Ms. Carroll met on a monthly basis with the program manager, Ms. Brown, to discuss updates and further fine-tuning of the web site. She also updates input for Program

and Project calendar of events data.

On 07/02/03, Ms. Hill prepared a macro version of the NASA AP2 methodology. The revision was sent to Ms. Carroll to upload to the website. After the arrival of our newest AP2 team member on July 7, 2003, Ms. Lewis's contact information was added to the AP2 Team page.

Ms. Carroll, under direction of Ms. Brown, reviewed process requirements and initiated a form submittal process for NASA approval to have the AP2 web site placed outside of the NASA firewall. This includes URL registration process and working with NASA Code IT to ensure that the necessary protocols and data fields required for public access are completed.

Public access to the NASA AP2 Program website beyond .gov customers will facilitate increased visibility and a wider distribution of information about the program and the benefits of association to potential domestic and international stakeholders.

Ms. Hill made recommended calendar changes to the NASA AP2 website on 08/08/03 and 08/20/03.

7. Integrated Technology Database

During this reporting period, ITB maintained the Integrated Technology Database (ITDb) and undertook development efforts to evolve it into a Web-enabled, user-friendly tool to aggregate and track Agency, military service, and international allies P2 needs and projects. The goal of this activity has been to evolve the current MS Access application into a more intuitive and productive tool for NASA. When complete, the new upgraded tool will have the following features:

- Web visibility;
- Controlled Web Access;
- Defined user roles and functionality;
- Inter Service/Agency functionality;
- Expanded data storage capacity; and
- Improved User Interface and functionality.

To develop the ITDb, Mr. Andrews and Ms. Carroll interacted with technology consulting firm Consultis to ensure that the ITDb was developed to meet the future requirements of the NASA AP2 program. To achieve this goal, teleconferences were conducted on the following dates:

Telecomm 1	5/13/03
Telecomm 2	5/22/03
Telecomm 3	5/29/03
Telecomm 4	06/05/03
Telecomm 5	06/11/03
Telecomm 6	06/19/03
Telecomm 7	06/26/03
Telecomm 8	07/03/03
Telecomm 9	07/10/03
Telecomm 10	07/21/03
Telecomm 11	07/23/03
Telecomm 12	07/24/03
Telecomm 13	08/05/03
Telecomm 14	08/15/03

During these teleconferences, Mr. Andrews and Ms. Carroll tracked the project activities (listed below) and performed extensive review and analysis of the ITDb operational capability as it was translated from Access to Cold Fusion. Numerous issues and disparities were identified for resolution involving items

determined to be above the functionality of Access ITDb and the items not meeting the same functionality as Access ITDb once applied to Cold Fusion. Minutes from all teleconferences are available upon request.

Key Project Milestones

Action	Orig. End Date	Date Slippage /Reason	Date Slippage /Reason	Date Slippage /Reason	Date Slippage /Reason	Actual End Date
Application Design Complete	5/29/03					Unsure as this was an internal date to Mr. Bee
Application Walk-Through	6/17/03	6/24/03 / See Development slippage reason	7/1/03 / See Development slippage reason	07/8/03 / See Development slippage reason	7/17/03 / See Development slippage reason	7/23/03 (5 weeks late)
Application Development Complete	6/20/03	6/27/03 (1 week) / Minutes from 6/11/03 - Due to compatibility issues with Netscape 4.7 (geared for ODIN deployment option). Mr. Andrews then instructed Mr. Bee to develop for compatibility with Netscape 6.0.	7/4/03 (2 weeks) / Minutes from 6/19/03 – Mr. Bee's server went down which caused development delays.	7/11/03 (3 weeks) / Minutes from 7/10/03 - Mr. Bee stated we are currently three (3) weeks behind the original project schedule. No specific reason/cause given.	7/22/03 (4 weeks 2 days) / Minutes from 7/21/03 – Mr. Bee indicated that coding would be complete by 7/22/03.	7/28/03 (5 weeks late)
Application Development Complete after testing and modification of code	6/27/03	7/4/03	7/11/03	7/18/03	7/29/03	8/29/03 (9 weeks late)
Documentation Complete	6/24/03	7/1/03	7/8/03	7/15/03	7/24/03 / Major testing issues must be addressed prior to completing Documentat-ion.	8/18/03 to Mr. Andrews for Review (7 weeks late)
Unit Testing Complete	6/25/03	7/2/03	7/9/03	7/16/03	7/25/03	08/05/03 (5 weeks 6 days late)
Final Testing and Signoff	7/1/03	7/8/03	7/15/03	7/22/03	7/31/03	9/3/03 (Tentative) (9 weeks late)

This process also required Mr. Andrews and Ms. Carroll to work with the Consultis consultant to define user roles and data access protocols for the ITDb web enabling process.

User Roles

Action	Public	Analyst	Administrator	Super User
View Chemical Library	X	X	X	X
View Hazardous Waste Library	X	X	X	X
View ODS Substance Library	X	X	X	X
View HazMat Substance Library	X	X	X	X
View Aerosol Substance Library	X	X	X	X
View Reference Sites	X	X	X	X
View Common Tech-Needs Report	X	X	X	X
View Project Information		X	X	X
View All Project Reports		X	X	X
Search Project Records		X	X	X
Create/Modify/Delete Users			X	X
Create/Modify Projects			X	X
Create/Add/Modify Contacts			X	X
Add/Modify HazMat Entries			X	X
Add/Modify Aerosol Entries			X	X
Add/Modify Pollutants/Wastes			X	X
Add Opportunities			X	X
Add related Tech Needs			X	X
Create/Modify Actions			X	X
Modify role privileges on users				X
Create/Modify/Delete Facilities				X
Delete Contacts				X
Create/Modify/Delete Organizations (Agencies)				X

During this reporting period, ITB also had a goal to determine the server requirements to support the web enabling of the ITDb. In accomplishing this goal, Mr. Andrews and Ms. Carroll first compiled cost data on the deployment options for the Integrated Technology Database and then conducted an analysis of technology capability against cost and future performance/service requirements. This data was presented to Mr. Hill and Ms. Brown, NASA AP2 Program Manager, to be factored in the deployment location decision. Locating the server at the ITB South Regional Office was identified as the most suitable location based on cost, functional requirements and maintenance. At this time, ITB is awaiting direction from the NASA AP2 Program Manager for establishing this server.

8. Customer / Stakeholder Interaction

ITB personnel routinely conduct internal and external meetings and other communications to track program/project status, complete action items, and assure customer satisfaction. The regular maintaining of MS Outlook e-mail distribution lists is an integral part of ensuring that the necessary team members are included on all e-mailed messages.

The Lead Free Solder Distribution list was maintained by Ms. Hill, with inputs from Mr. Greene.

The following outline defines the updates for this reporting period:

Date	Removed	Added	Changed
July 15, 2003		2	
July 18, 2003	2		
July 23, 2003	1	1	
August 19, 2003	3	1	3

The current list consists of 182 participants.

JG-PP Working Group Distribution List:

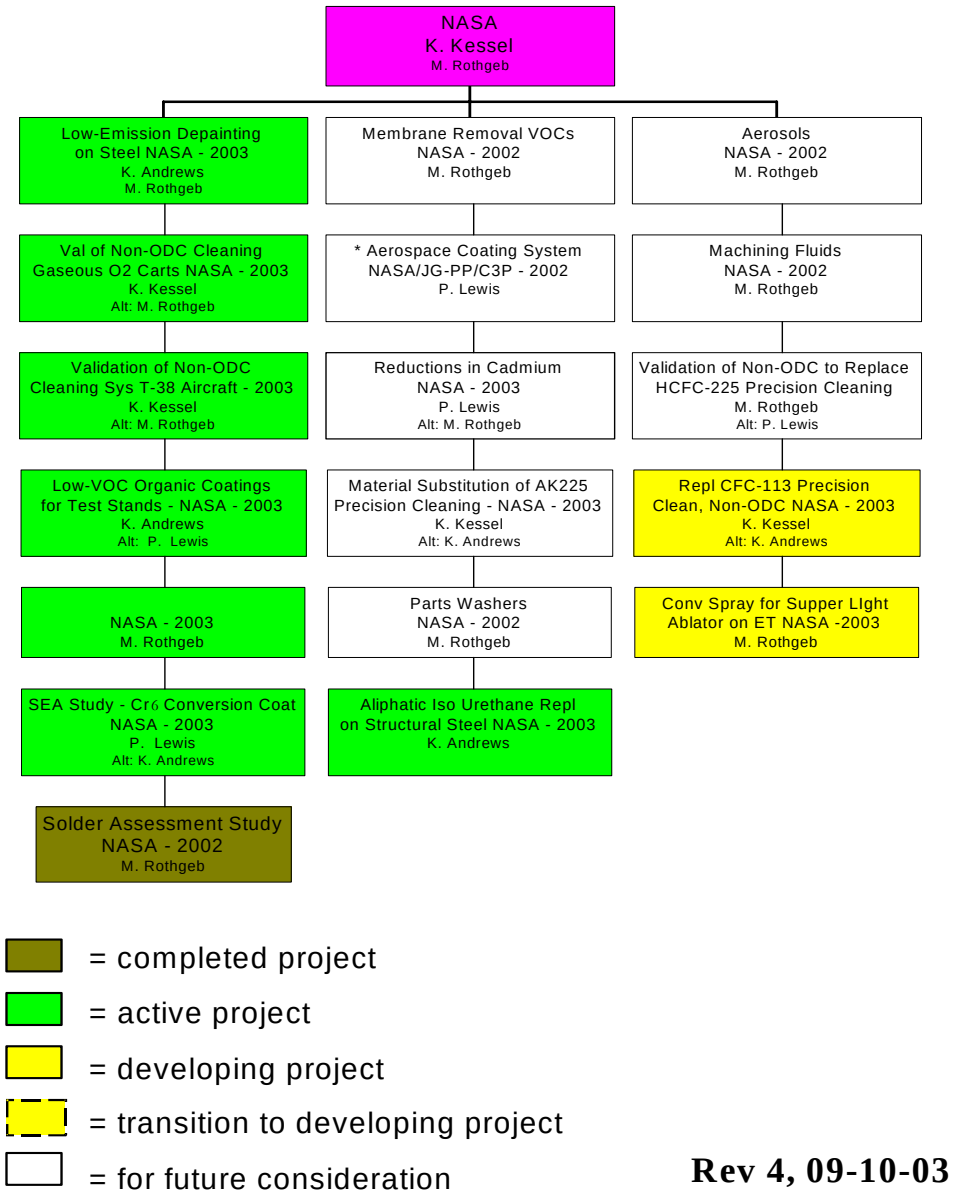
Date	Removed	Added	Changed
July 15, 2003		2	
July 18, 2003	2		

ITB continued to update the project points of contact list for each NASA Center. As projects develop, individual stakeholder lists will be generated for that specific project. The general listing of contacts within NASA Centers is updated as new contacts or change of contact information is made available. Keeping updated points of contact will allow the AP2 Office to minimize time searching for new or updated contacts as new projects develop.

B. Agency Business Entity

ITB continued to identify, analyze and prioritize Center and Enterprise P2 needs. The result has been the recent development of a number of technical thrust areas and candidate P2 projects within the NASA community and with other external sources. A major focus of this reporting period was the initiation of Agency P2 projects. With these projects, ITB staff is fostering cooperation between NASA Centers to reduce their HazMat profile, in the process epitomizing the "One NASA" objective. Figure 1 depicts the ITB engineering assignments to the 17 Agency projects that are active or under development.

Figure 1. NASA AP2 Agency Business Entity Opportunities/ITB Assignments



1. Professional Networking

ITB developed and maintained professional networks with all NASA Centers, major field installations, and Enterprise Program offices to help meet its goal of identifying project participants, new P2 needs, and possible solutions. In accomplishing this, ITB hosted five teleconferences, developed meeting minutes, and completed numerous teleconferences to define the technical objectives of candidate Agency P2 projects and further develop ideas for future projects:

1. Precision Cleaning Technologies
   - July 15, 2003 teleconference
2. Convergent Spray Technology
   - August 5, 2003 teleconference
3. NJIT Membrane Technology
   - August 7, 2003 teleconference
4. Coating/Depainting Technologies
   - July 9, 2003 teleconference
   - August 20, 2003 teleconference

During this reporting period, ITB updated its list of NASA facility technical points of contact for high-priority AP2 candidate projects. Several new and important project stakeholders were identified, including:

1. Oxygen Line Cleaning Technologies
   - 8 POCs at Johnson Space Center
   - 2 POCs at Columbus Air Force Base
   - 1 POC at NASA depot in El Paso, TX
   - 1 POC at Northrop Grumman, Melbourne, FL
2. Convergent Spray Technology
   - 1 POC at Marshal Space Flight Center
3. NJIT Membrane Technology
   - 1 POC at Applied Membrane Technology
4. Parts Washing Technologies
   - 1 POC at Kennedy Space Center
   - 1 POC at Johnson Space Center
5. Coating/Depainting Technologies
   - 1 POC at KSC Safety, Health & Independent Assessment
   - 1 POC at KSC Spaceport Services
   - 2 POC at KSC Shuttle Processing
   - 1 POC at Ames Research Center
   - 1 POC at White Sands Test Facility
   - 1 POC at Jet Propulsion Laboratory
   - 1 POC at Dryden Flight Research Center

The increasing list of stakeholders (NASA and other) is representative of the increasing visibility of the program. This increases the effectiveness of the program exponentially as more people are made aware of the benefits related to teaming and reduced risk and resource commitment.

2. SEA Support

ITB staff, particularly Mr. Andrews, Mr. Greene and Ms. Lewis, actively interfaced with members of the Shuttle Environmental Assurance (SEA) Initiative to offer technical knowledge relevant to SEA activities and studies for P2 Project development. ITB participated in three SEA teleconferences, on July 8, August 12, and September 9, 2003.

Mr. Andrews provided support to Ms. Brown on SEA issues particularly the SEA collaborative studies. In this capacity, Mr. Andrews participated in teleconferences representing the NASA AP2 Program and co-founded the SEA Hex Chromium sub-committee. Mr. Andrews also contributes managerial and technical expertise to the SEA regarding emerging concerns such as brominated flame retardants and will continue to work in this capacity to address existing and emerging environmental issuses. Mr Andrews will be supported in this activity by the new hire, Ms. Lewis.

The NASA AP2 Office provides support to the SEA in the development and management of its projects. ITB responded to Action Request 306 – SEA Status Report. The focus of this report was to summarize the funding and mitigation status of SEA issues and highlight any other concerns.

The support lent by the ITB office has been instrumental in accelerating the SEA process of initiating project efforts. While work on the Chrome collaborative study was initially scheduled to begin in October 2003, the efforts of the AP2 engineers has resulted in an early initiation of this effort, the formation of a Chrome Sub-committee and the embrace of a methodology based on a joint test protocol and potential alternatives report. Unfortunately, the SEA members have been slow to provide ITB their technical requirements and potential alternatives. Ms. Lewis alerted the SEA members to this concern at the September 9 SEA teleconference.

3. Five New Agency Projects

During the reporting period, ITB actively worked with NASA Centers to meet ITB's goal of initiating five new Agency P2 projects. ITB selected these projects from the following seven potential project ideas:

1. **Identification, testing and validation of alternatives to Aliphatic Isocyanate Urethanes on carbon steel structural elements across NASA (Test Stands and Shuttle Support)**
2. **Identification, testing and validation of low-emission surface preparation/depainting technologies for carbon steel structural elements across NASA (Test Stands and Shuttle Support)**
3. **Validation of non-ozone depleting cleaning system for on-aircraft flushing of T-38 oxygen lines and/or in-place cleaning of gaseous oxygen carts**
4. **Use of convergent spray technology to apply SuperLight Ablator to the External Tank at NASA MAF**
5. **Identification, testing and validation of chrome-free conversion coatings for NASA Shuttle Elements (SEA collaborative study)**
6. Identification, testing and validation of non-ozone depleting solvent to replace CFC-113 in NASA precision cleaning processes
7. Identification, testing and validation of non-ozone depleting solvent to replace AK-225 in NASA precision cleaning processes

ITB recommends to the NASA AP2 Program Manager the first five (**bold**) projects in the above list as viable efforts. These five projects have been recommended based on their ability to confer to NASA:

- Reduced legal and environmental liability in operations;
- Reduced Environmental, Health and Safety costs associated with current operations; and
- Multiple-Center interest and thus reduced Center (and Agency) resource commitment.

On 08/30/03, Ms. Lewis and Mr. Rothgeb saw to the quarterly update of all the Project

Summary Plans (PSPs) by the respective project leads. The PSPs were placed into a 3-ring binder for the NASA AP2 Program Manager to quickly and easily review at a moments notice.

a. Coating Systems/Depainting Projects

The NASA AP2 Program (with the input of Center Stakeholders) identified two projects under the technical area Coating/Depainting.

1. Identification, testing and validation of alternatives to Aliphatic Isocyanate Urethanes; and
2. Identification, testing and validation of "new" surface preparation/depainting technologies; the goal being to

   - Reduce the quantity of secondary waste;
   - Reduce fugitive emissions and dust generation;
   - Achieve an acceptable surface profile;
   - Reduce and contain waste and emissions during lead paint removal projects.

At a meeting on 08/07/03 with Mr. Andrews and Mr. Kessel, Ms. Brown stated that those coating/depainting projects that seemed most viable for completion within 24-months are the preferred projects. Mr. Andrews and Mr. Kessel elaborated on the above-stated efforts regarding coating/depainting projects and how these differed from the JG-PP Support Equipment (SE) project. Mr. Andrews and Mr. Kessel also addressed the scope of the SE project and elaborated on the AP2 methodology whereby data from the SE project and the Air Force's ICBM project would be incorporated into the current projects to reduce duplication of effort.

Identified stakeholders for the two projects are the same; therefore, it was decided that the discussions of the projects would proceed simultaneously until such a time that it is no longer effective. Engineers Andrews, Lewis, and Rothgeb have been collecting data and managing stakeholder input. Congruent with these efforts, the AP2 engineers have distributed testing/performance requirement survey instruments and have begun penning the Joint Test Protocols (JTPs) and Potential Alternative Reports (PARs) for both projects. The Draft JTPs will be submitted to the projects group on October 1st. The JTPs will ensure that the needs of the project stakeholders are addressed in the testing regiment and the selection of alternative materials/processes.

Due to concerns by project stakeholders, the distribution list has been extended to include Center Industrial Hygiene representatives. Mike Cardinale (Aerospace Medicine and Occupational Health) and Guy Camomilli (Senior Environmental Health Officer) of KSC have expressed interest in participating in these projects. Mr. Camomilli has offered to contact Industrial Hygiene and Safety representatives at other centers since they will have interest in these projects; as well as Jon Mullin (Agency Manager of Operational Safety) who may wish to become involved in these projects from the standpoint of Agency Safety. Specifically, the use of Aliphatic Isocyanate Urethanes is a concern in both of these arenas (in addition to the Environment) and thus the growing Agency interest in the progress of this effort. The NASA engineers have also submitted a schedule to the group by which these projects will be managed.

The next step in the process is to gather data on potential alternatives or replacements. Then only the most viable of these are put through the testing regiment; therefore, all the testing requirements must have been identified by the various centers first. The PAR will determine what alternatives are on the market or in the latter stages of development that can be embraced for testing. Once a listing has been compiled, it will be distributed to the group. These alternatives will be analyzed for performance requirements as well as whether they satisfy industrial hygiene, safety, and environmental requirements.

For the Depainting Project, the NASA AP2 Office is currently investigating support under the Launch Umbilical Tower #1 (LUT-1) Storage Area Remediation project. Mr. Andrews is currently reviewing feasibility of this option with Ms. Gail King - Remediation Project Manager, NASA/KSC. If feasible, teaming to share resources under the LUT-1 project will prevent duplication of resource commitment at the Center and Agency levels in the demonstration and validation of new low-emission technologies for NASA applications.

b. Precision Cleaning Projects

During the July - September reporting period it was the intent of the NASA AP2 Office to develop the precision cleaning project opportunities into stand alone projects with developing JTPs. During this reporting period, the majority of effort was directed toward developing one or more possible oxygen line cleaning projects. Opportunities in precision cleaning of oxygen lines, specifically NASA JSC T-38 aircraft, shows the most promise for maturing into a full scale project. During the weeks of July 14 and 21, 2003, the points of contact were established at JSC for this effort. This included the T-38 flight line operations as well as the JSC environmental directorate. Interest in this project has also been expressed from the Air Force regarding T-38 oxygen line cleaning and a possible joint NASA/Air Force project could develop. Mr. Kessel contacted Columbus Air Force Base, Mississippi, on 08/22/03 to discuss oxygen line cleaning processes.

Development of one or more projects to test non-ozone depleting solvents as replacements for CFC-113 and AK-225 in NASA precision cleaning processes, not related to T-38 oxygen line cleaning, failed to gain momentum during the reporting period. A major reason for this seemed to be (a) a majority of NASA Centers has already implemented alternatives to CFC-113, and (b) the absence of a near-term legislative or agency driver for replacing AK-225. During the July 15, 2003 precision cleaning telecomm, MAF and SSC recommended that the AK-225 issue be put on hold until more information can be obtained on alternative solvents. As a result, it has now been decided that development of such a clean room will be on hold until new data or information comes to the attention of the NASA AP2 Office supporting a renewal of the idea. The NASA AP2 Office will continue to track the issue and inform NASA Centers of emerging technologies.

Continuing to develop NASA and Air Force points of contact pertaining to precision cleaning projects will reduce the risk of duplicating effort for both agencies. Embarking on joint efforts will allow costs to be divided across the agencies reducing cost while increasing each agency's return on investment. Multiple agency participation in precision cleaning projects gives agency participants leverage for present and future project funding.

c. Convergent Spray Technology (CST) Project

It was identified during the Pollution Prevention Opportunity Needs Assessments (PPONAs), performed at Michoud Assembly Facility (MAF), that the process of preparing various ablators for the External Tank (ET) consumes high quantities of solvents. During the PPONA process, it was determined that the resulting ablator mixes have a short pot life which results in large quantities of wasted material that is unsuitable for re-use and must be disposed of as hazardous waste. The cork-based ablator known as SLA-561 is a sprayable ablator that is mixed in batches and then sprayed onto critical areas of the ET. It was recognized during a visit to the Solid Rocket Booster (SRB) refurbishment facility at KSC that a similar ablator known as MCC-1 was applied to critical components of the SRBs in a similar fashion. USA personnel informed the AP2 Office of the new technology, developed by USA, that has been designed to spray MCC-1 without having to pre-mixing the ablator, effectively eliminating pot-life issues and worker exposure during mixing. The technology, known as a Convergent Spray Technology (CST), also allowed USA to eliminate all solvents from the mixture of MCC-1. Since the two processes and materials are very similar, and are exposed to similar environments during launch, it is hopeful that CST can be used at MAF and produce similar benefits as seen at KSC.

On August 5, 2003, technical representatives from Marshall Space Flight Center, Kennedy Space Center, and Michoud Assembly Facility participated in a teleconference with representatives from the NASA AP2 Office. The objective of the teleconference was to discuss previously assigned action items that were not yet completed and to discuss the timeline and pace of the project. Action items were taken to distribute past reports to the AP2 Office that were generated when SLA was re-qualified for flight in the past and when the CST system was demonstrated and validated for use on the SRBs.

Mr. Rothgeb identified that previous re-qualification of the SLA used at MAF occurred in 1994 and that the testing protocols used for that could be leveraged from MAF and used as a basis for a draft JTP. Mr. Preston Landry of MAF identified that it would serve as a good baseline but that more requirements may need to be added to the JTP considering that the methods for mixing and spraying would be different than current processes. Mr. Landry notified Mr. Rothgeb that he would send the report of that re-qualification to the AP2 Office. Mr. Phil Franklin noted that there are SRB qualification reports generated from the process of switching to the CST system and he would send those reports to the AP2 Office for incorporation to the JTP as well.

Considering the return to flight priorities at MAF and other NASA Centers, it was a concern of the stakeholders that time would be limited to work on this project. Because of this, the timeline and pace of the project were discussed. Stakeholders involved determined that quarterly teleconferences should be held as opposed to monthly, and that the pace would be re-assessed after return to flight. Mr. Rothgeb noted that most of the initial work intended to develop a JTP would be performed by the AP2 Office and that the pace of its initial development would not be severely hampered by the shift to quarterly meetings.

The next teleconference will be held on November 4, 2003. The goal for the next meeting is to develop a draft JTP for the project that will be reviewed just prior to or just after the next teleconference.

4. Migration of Joint NASA / DoD Projects

ITB routinely monitors JG-PP and other DoD P2 projects for applicability to NASA programs and process with the idea to maximize NASA participation and technology migration of completed and on-going projects. Two goals for this reporting period were (1) to obtain NASA Center go / no-go on O2 line cleaning as an Agency project, and (2) to assist SEA in scoping efforts on non-chrome coatings and cadmium-free plating.

As requested by Ms. Brown, engineers Andrews, Rothgeb, and Greene investigated a possible NASA-Air Force partnership on dry film lubricants (DFLs) in maintenance and processing operations. It was discovered, however, that the NASA applications were of extremely high load whereas the Air Force was concerned with DFLs in low load applications.

NASA AP2 supported the SEA collaborative studies in hexavalent chromium replacements (primers and conversion coatings), cadmium in plating operations and HCFC-141b. Mr. Andrews and Ms. Lewis supported SEA Action Request (AR) 305, a request for data and information from the Shuttle Elements related to the SEA collaborative studies and drove an early start date on the project titled "Alternatives to Hexavalent Chromium in Conversion Coatings". Specifically, Mr. Andrews (AP2) and Eric Eichinger (Boeing) distributed a testing/performance requirements survey for chrome conversion coatings in shuttle processing. The other collaborative studies are on hold until the SEA Face-to-Face meeting scheduled October 8-10, 2003. The NASA AP2 office will be providing managerial and technical support to the SEA collaborative studies with a project methodology based on the Joint Test Protocol and Potential Alternatives Report.

Mr. Andrews and Lt. Shawn Fontenot (USAF, AFRL/MLSSO-CTIO) also discussed an Air

Force/Northrop Grumman wipe solvent (chrome free) project. Lt Fontenot indicated that the report for this effort is now complete and is awaiting signature and government approval for distribution. During subsequent conversations with the SEA membership, Mr. Andrews conveyed the observations on Air Force projects or papers relevant to the SEA. The SEA membership (Steve Glover, Eric Eichenger, Earl Pratz etc.) indicated that this information is critical in reducing resource duplication and would like Mr. Andrews to forward any reports or data he deems relevant to SEA efforts to the group. By reviewing and channeling information from the Air Force to the SEA and along the corridor of the Agency, the NASA AP2 office is successful in either identification of technologies and generation of interest or the prevention of duplicated effort by Air Force and NASA to find solutions to common problems

On August 8, 2003, Mr. Rothgeb contacted representatives within both NASA and the Navy concerning Auxiliary Power Units (APUs) currently being used in Shuttle and Navy systems. It was determined that a possible project may exist looking to test replacements for hydrazine-based APUs. A project already exists within NASA to develop alternative APUs, but it has been dormant for the last few years due to funding restraints. This existing NASA project was known as the Electronic Auxiliary Power Unit (EAPU) project but was re-named the Orbiter Advanced Hydraulic Power System (AHPS) project. Although activity has been limited, testing continues on some level for the systems being tested. The main objective of the project is to reduce flight safety risks and ground safety risks by developing a replacement for the hydrazine based APUs used on the Orbiter. Hydrazine is reasonably anticipated to be a carcinogen to humans, is highly toxic and corrosive. Hydrazine is one of the most toxic substances used by NASA and the processes involved in the testing and use of Hydrazine result in high levels of hazardous waste generated at KSC, WSTF and other locations where the Orbiter is maintained or where it lands. The elimination of the APUs on the Orbiter would result in a large reduction of risk to human safety in both ground operations and in-flight operation of the vehicle. The APUs currently in use represent 30% of the overall risk associated with loss of crew and vehicle. If the APU were replaced, the risk contribution would be reduced to only 5%.

The Navy has been looking at APU replacements for submarines and other systems but did not respond to requests made for this information.

a. Nonchromate Coating Systems

Mr. Andrews continued his efforts this reporting period to identify and migrate DoD successes with non-chromate coating systems to NASA centers or Shuttle Elements. Mr. Andrews held discussions with maintenance representatives, Phil Vaughn and Michael Axline, at JSC who indicated their intention to move to PreKote X when their current store of Alodine 1200 is exhausted.

Mr. Andrews has also been in discussions with Lt. Fontenot on the Air Force's effort to embrace non-HazMats in corrosion protection/maintenance and potential for teaming or information sharing with the NASA AP2 Office. Lt. Fontenot has indicated that PreKote testing is currently being conducted on two T1A aircrafts at Columbus Air Force Base and that Maj. Dan Bullock from the Air Force Corrosion Prevention and Control Office is in charge of this effort. Maj. Bullock has been conducting a 6-year test with the PreKote and is currently in the 5th year. Mr. Andrews has contacted Maj. Bullock on this and other corrosion/maintenance Air Force activities.

Lt. Fontenot also provided Mr. Andrews with a report addressing the test results of a Non-Chromate Pre-treatments vs. Non-Chromate Primers project. This project was undertaken to determine if it is better to eliminate the chromates from the pre-treatments (chemical conversion coatings - CCC) or eliminate the chromates from the primers. The data showed that removal of chrome from either the conversion coat or the primer will not significantly affect the corrosion protection provided by the coating systems and that adhesion, a critical performance characteristic, was better when a non-chrome conversion coat was used with a

chrome primer than when a chrome conversion coat was used with a non-chrome primer. It was also observed in this study that when comparing the non-chrome conversion coats (X-It Prekote vs Alodine 5200), that the two materials performed equally well in salt spray exposure. The X-It Prekote material provided better filiform corrosion protection than the Alodine 5200. The X-It Prekote also had better adhesion than the Alodine 5200, but Alodine 5200 showed better elongation characteristics than the X-It Prekote. Mr. Andrews has distributed this report to the SEA.

b. Lead-Free Solder for Electronic Circuits and Components

Mr. Greene and Mr. Kessel continued to keep key personnel from NASA Centers, especially NASA MSFC and JPL, actively involved in the ongoing JG-PP Lead-Free Solder project. The NASA POCs participated in scheduled Lead-Free Solder project teleconferences held during this reporting period. In addition, ITB kept in touch with technical efforts that NASA has underway with lead-free organizations such as CALCE to coordinate this projects activity and reduce duplication of effort. (See Section B.5, NASA EEE Groups, of this Status Report for further details.)

c. Alternatives to Cadmium for Corrosion Protection and Threaded Part Lubricity Application (BISDS)

On 08/11/03, Mr. Tony Eng of the Navy contacted Mr. Rothgeb on behalf of Mr. Craig Matzdorf concerning Cadmium for Corrosion Protection and Threaded Part Lubricity Applications. Mr. Eng was placed in charge of the portion of the JCAT project dealing with treaded part lubricity and hard chrome fasteners. Mr. Eng was interested in the needs that NASA has in this area. The SEA group recently tasked its members to identify the locations within the Shuttle Program that used cadmium-plated fasteners. This information is currently being gathered. Mr. Rothgeb notified Mr. Eng of this and put him in contact with Mr. Eric Eichenger at Boeing to coordinate the information from the SEA group. Mr. Rothgeb requested an update from Mr. Eichenger on this situation and the status of the Navy's and NASA's involvement in the project. Mr. Rothgeb is awaiting a response from Mr. Eichenger concerning this update.

d. Low/No VOC and Nonchromate Coatings System for Support Equipment

The Air Force met a major milestone in the completion of the field-testing and submittal of a draft Joint Test Report for Low/No VOC and Nonchromate Coating System for Support Equipment. The scope of the field-testing involved evaluating support equipment, aircraft generators, light carts, towing tractors and de-icing trucks located at selected demonstration sites (Brunswick Naval Air Station, NAVAIR Solomons, Cape Canaveral Air Force Station and Patrick Air Force Base) every three months for an 18-month time period. Field evaluation included gloss and color measurement readings and an inspection of test articles for coating failure and corrosion was performed during each field observation in order to monitor the coating systems performance.

NASA had a direct interest in the project since the NASA Corrosion Technology Test Bed located at Kennedy Space Center performed specific testing requirements outlined by NASA-STD-5008 *"Protective Coating of Carbon Steel, Stainless Steel, and Aluminum on Launch Structures, Facilities, and Ground Support Equipment".* With numerous pieces of support equipment and launch support facilities exposed to a wide array of environmental conditions, NASA is always looking for alternative coatings that provide superior environmental protection while reducing hazardous waste generation.

The project resulted in three coatings being approved for NASA use under NASA-STD-5008: two primers (Ameron Dimetcote 9HS Zinc Rich Primer and DeVoe Catha-Coat 304H) and a

topcoat (Ameron PSX 700). Both of the approved primers have VOC contents lower than the JG-PP Support Equipment baselines as they appear in the PAR. The approved primers would be categorized in the lowest VOC category when appearing in NASA-STD-5008. The approved topcoat had a VOC content that was significantly lower than the JG-PP Support Equipment baselines as they appear in the PAR. The topcoat has such a low VOC content that it would be below the category parameters currently established in NASA-STD-5008.

To facilitate technology migration and better understanding of the coatings currently used on support equipment located throughout NASA centers, a follow-on effort will continue into the next reporting period. As such, Mr. Kessel will collect information on the type of support equipment used at other centers, if the equipment is maintained on-site, the type of coatings used on the equipment and any specifications or standards that dictate the coatings that are to be used.

Once the proper information is collected on support equipment located throughout NASA centers, ITB will have a better understanding as to whether the newly qualified coatings will benefit NASA by reducing the total quantity of VOC emissions being released annually. In implementing coatings qualified through the JG-PP Low/No-VOC and Nonchromate Coatings System for Support Equipment Project, NASA stands to realize its return on investment while reducing hazardous waste generation.

e. Non-ODC Oxygen Line Cleaning

The joint Air Force and NASA project for cleaning on-aircraft T-38 oxygen lines and/or in-place cleaning of gaseous oxygen carts gained momentum during the reporting period. During the weeks of July 14 and 21, 2003 points of contact were established at NASA JSC. One reason for the increased interest was ITB's communication to NASA stakeholders of the processing benefits and safety and health benefits offered by the proposed new cleaning system.

Tear down, cleaning and reassembly of the T-38 oxygen line system presently takes three (3) to four (4) weeks at NASA JSC. Implementation of the Versar Portable Oxygen Line Cleaning System (OLCS) will save NASA JSC three (3) to four (4) weeks of down time per T-38. Studies conducted by Versar on Air Force F-15, F-16 and B-1 aircraft have shown that the OLCS removed contamination from oxygen lines that were previously cleaned by conventional methods. The OLCS also reduces hazardous waste associated with T-38 precision cleaning procedures while reducing potential risk to astronaut health and safety.

Because of persistent contact by Mr. Hill, Mr. Rothgeb and Mr. Kessel with personnel at JSC, a demonstration of the Versar OLCS is being contemplated by JSC on a NASA T-38 aircraft. The tentative date for the demonstration is the week of October 13, 2003. A smaller version of the Versar OLCS has been developed for oxygen carts, the Versar Gaseous Oxygen Cart Cleaning System (GOXCCS). A proposal was made to JSC to demonstrate and validate the GOXCCS in conjunction with the OLCS, if possible. Representatives from all NASA centers will be invited to the Oxygen Line Cleaning System and Gaseous Oxygen Cart Cleaning System demonstration.

Mr. Andreas Goetzfried, SGS, indicated to Ms. Brown that Ms. Jayne Hance (Manager, Environmental Health, Safety and Medical) at Northrop Grumman, Melbourne, Florida was interested in learning more about the in-line oxygen line cleaning system. On 08/27/03, Mr. Kessel contacted Ms. Hance and explained that the NASA AP2 Office is currently working to coordinate a joint NASA/Air Force effort to implement the OLCS technology at NASA JSC and multiple Air Force depots. Ms. Hance was emailed several documents that further explained the technology. Ms. Hance did not have the details of the precision cleaning processes being performed at the Melbourne Northrop Grumman facility, but stated that she will pass the information along to the appropriate personnel.

f. Portable Laser Coatings Removal System (PLCRS)

The Air Force scheduled a teleconference for the Portable Laser Coatings Removal System (PLCRS) on 07/01/31, but it was cancelled. The Air Force will distribute project information for discussion at the December 10-11th DoD Laser Technology Meeting.

On 08/06/03, Mr. Rothgeb contacted Mr. Mongelli to discuss the progress of the laser systems. Mr. Mongelli informed Mr. Rothgeb that testing was continuing and that sample panels from Boeing (Shuttle) had just been delivered to the laser lab at Wright-Patterson Air Force Base and they would be stripping those in the near future. Mr. Mongelli also noted that one of the four laser systems was deselected based on the limited maturity of the technology and the difficulty in operation. Mr. Rothgeb will continue to keep in contact with Mr. Mongelli, as the laser stripping systems that are being tested could be applicable for use for various applications within NASA.

Numerous Aluminum panels are being tested and several non-metallic panels. Boeing supplied several non-metallic panels consisting of 14-ply graphite epoxy for testing. NASA's test panels were primed with 10PW22-2 or Super Koropon 515-K01A to a thickness of 3mils and no topcoat. The acceptance criteria for strip rates are based on requirement analysis or survey results and/or 0.06 ft^2 per minute at six (6) mils nominal thickness. Additionally there must be no erosion observable at 10x magnification, no significant change in harness, no statistically significant degradation of tensile strength and no evidence resin erosion or fiber damage to the composite material. Other standards must also be met for the tests that are not discussed here. Results of all testing will be detailed during the face to face in December.

5. NASA Electrical, Electronic, and Electromechanical (EEE) Groups

Mr. Greene continued to network with members of NASA's EEE community regarding lead-free issues. ITB met its goals for this reporting period of (a) determining the status of NASA HQ (Code Q) policy on lead-free solder, and (b) supporting Agency requests for lead-free solder information/progress. Specifically, ITB learned via communication with NASA MSFC in August that, in addition to funding continued efforts by NASA MSFC and GSFC to study lead-free solder material properties and tin whiskering (respectively), NASA HQ also funded two new one-year studies, to begin in October 2003:

- Lead-free Solder Survey Body of Knowledge
- Tin Whiskering Survey Body of Knowledge

The objective of these studies is to perform a technology readiness overview of lead-free solder and tin whiskering. The end product will be recommendations on what positions and measures that NASA should take with respect to the introduction of lead-free solders and plating prone to whiskering. For the Lead-Free Solder Body of Knowledge project, NASA MSFC is proposing to use the NASA AP2 Program as the contract vehicle. The NASA AP2 Office is awaiting receipt of a Statement of Work (SOW) from MSFC.

On 08/21/03, ITB received from Ms. Anne Meinhold a copy of Boeing-Huntington Beach's M&P Lab Report, "Lead-Free Solder Investigation for Orbiter Use," dated June 26, 2003. Boeing's study objective was to investigate the likely impact of lead-free solders on the Orbiter program. Boeing acknowledged that a significant concern is the performance and reliability of lead-free solder joints over time. Boeing's study also compared the JG-PP test plan for evaluating lead-free solders to current Orbiter requirements for electronics systems. Because JG-PP is using standard board manufacturing processes, the baseline (tin-lead) boards will be manufactured in a similar manner to the boards used on the Orbiter. The main difference between the JG-PP baseline boards and the boards used on Orbiter is that the JG-

PP test plan calls for high Tg laminate boards (glass transition temperature of 170 deg. C), whereas the majority of boards on Orbiter are the standard low Tg (140 deg C) laminate type. (JG-PP chose high Tg boards because they are less likely to fail with the lead-free solders and thereby compromise the data analysis.) Boeing noted that the common performance requirements in the JG-PP test plan "match up well with the Orbiter requirements for avionics." They noted that there are three tests performed on Orbiter electronics/avionics systems that are not addressed in the JG-PP test plan: dielectric withstanding voltage, corona test, and a lightening strike test. These three tests are performed per MF0004-002. Orbiter will eventually need to address these tests when evaluating lead-free solders. ITB was not made aware of these additional Boeing test requirements until our detailed reading of the Boeing report on August 28.

On 08/28/03, Mr. Greene participated in a NASA Workmanship Technical Committee (NWTC) teleconference. Discussion topics included the status of NASA's Space Addendum to IPC/EIA J-STD-001C and some limited discussion of field instruments for detecting lead vs. lead-free materials on circuit cards (none of which look promising at this time). The next NWTC meeting has not been set yet, but discussions are being monitored by ITB.

During the 08/28/02 NWTC teleconference, it was reported that new legislation has been passed in Maine requiring that the disposal of electronic equipment (containing a printed wiring board) containing lead is the responsibility of the manufacturer of that equipment (so any board assemblers). So any manufacturer of computers, TVs, etc. needs to set up a disposal process to cover the equipment they've sold. The law takes effect in 2005, with full implementation in 2006.

NWTC team members also reported that in August, NASA GSFC hosted a demonstration of Niton's handheld X-Ray Fluorescence (XRF) machine to check for pure tin-plating in situ. The Niton device was heavily promoted and being used by Northrop-Grumman after they observed a considerable number of incidences of pure tin-plated component leads being received, including instances where pure tin leads were specifically prohibited. The preliminary conclusion of Mr. Jay Brusse, GSFC, was that the technology was crude for his purposes. The unit scans deeply—to deeply—into the board, so it picks up substrate metallurgy, too. It does not allow one to focus just on the termination finish. The machine is also expensive: $30-35K. Mr. Jim Blanche reported that some hardware stores have a Pb testing kit for items like china flatware and that these may be a better option for field use. As a follow-up, in September, Mr. Kessel gathered information on a LeadCheck™ system that uses a color-changing reagent upon contact with Pb. This information was shared with the NWTC members in late September.

6. AP2 Financial Management Tools

After analysis of various methods, ITB recommends the JG-PP cost-benefit analysis (CBA) methodology as the financial analysis method for ITB to use on Agency AP2 projects. All new project CBAs will follow the JG-PP CBA Methodology. Ms. Lewis developed a guidance manual on how to conduct CBAs and specifically how to use the P2/Finance software. This manual will allow those employees new to CBAs to come up to speed quickly.

NASA AP2 took the lead in helping JG-PP incorporate earned value management (EVM) techniques into JG-PP's methodology. To support this activity, ITB developed and proposed an earned value analysis to the NASA AP2 Program Manager, and subsequently to the JG-PP Working Group, as a project-level metric. The JG-PP WG accepted the EVM as a means of keeping projects on track and using resources more efficiently. ITB is implementing the same earned value concepts into the new NASA AP2 projects.

7. Prepare AP2 Project Technology Reports

Documentation of stakeholder performance and testing requirements; their decisions to down-select alternatives; and the testing results are integral parts of the AP2 project execution methodology. Such documentation ensures traceability of decisions, can enhance technology migration, and reduces future duplication of efforts. The following table summarizes the status of the AP2 project technology reports.

AP2 Project	PAR	JTP	CBA	JTR
Validation of non-ozone depleting cleaning system for on-aircraft flushing of T-38 oxygen lines and/or in-place cleaning of gaseous oxygen carts	Technology Transfer Project—PAR not required	Technology Transfer Project—JTP not required	A decision to prepare a CBA will be made after any demonstration	A final report will be published after demonstrations
Identification, testing and validation of alternatives to Aliphatic Isocyanate Urethanes on carbon steel structural elements across NASA (Test Stands and Shuttle Support)	Begun, but awaiting responses from NASA centers of potential alternatives to incorporate into PAR	Begun, but awaiting NASA Centers' validation of testing methods and requirements for incorporation into JTP	Awaiting development of JTP and PAR before determining need for CBA	Testing not begun yet
Identification, testing and validation of low-emission surface preparation/ depainting technologies for carbon steel structural elements across NASA (Test Stands and Shuttle Support)	Begun, but awaiting responses from NASA centers of potential alternatives to incorporate into PAR	Begun, but awaiting NASA Centers' validation of testing methods and requirements for incorporation into JTP	Awaiting development of JTP and PAR before determining need for CBA	Testing not begun yet
Use of convergent spray technology to apply SuperLight Ablator to the External Tank at NASA MAF	Technology Transfer Project - PAR not required.	Begun, but currently awaiting testing methods and requirements from MAF, MSFC	Awaiting development of JTP before beginning CBA	Testing not begun yet
Identification, testing and validation of chrome-free conversion coatings for NASA Shuttle Elements (SEA collaborative study)	Awaiting initial responses to Requirements Surveys before beginning	Currently gathering testing methods and requirements from SEA Elements	Awaiting development of JTP and PAR before determining need for CBA	Testing not begun yet

Details of the status and plans for these documents follow.

a. Potential Alternatives Reports

Potential Alternative Reports (PARs) discuss the viable alternatives, the down-selection process, and the alternatives ultimately recommended for testing/implementation. As such, writing of the PARs usually begins after stakeholders have identified some or all of their performance requirements. Only the most viable of the identified alternatives are then usually tested. Identified alternatives will be analyzed for performance requirements as well as whether they satisfy industrial hygiene, safety, and environmental requirements.

ITB has begun preparing PARs for the Aliphatic Isocyanate Urethane Replacement on Structural Steel and Low-Emission Depainting on Steel NASA AP2 Office projects. The PARs will determine what alternatives are on the market or in the latter stages of development that can be embraced for testing. Once a listing has been compiled, it will be distributed to the group. These alternatives will be analyzed for performance requirements as well as whether they satisfy industrial hygiene, safety, and environmental requirements. Developing PARs for these projects has been a very difficult process. Despite numerous requests for information, the participating centers have failed to respond and obtaining information and data from them is crucial to the process.

Developments of the PARs for the SEA Collaborative Study on Chromate Conversion

Coatings and Convergent Spray Technology projects are awaiting the initial responses from the stakeholders to the Requirements Surveys.

For the Validation of Non-ODC Cleaning System for T-38 Aircraft and the Validation of Non-ODC Cleaning System for Gaseous O2 Carts projects, PARs will not be developed. These are Technology Transfer Projects and the non-ODC cleaning systems being evaluated already use HFE-7100 as a solvent. There is no need to evaluate other solvents for these processes.

b. Joint Test Protocols

ITB has begun preparing Joint Test Protocols (JTPs) for the Aliphatic Isocyanate Urethane Replacement on Structural Steel, Low-Emission Depainting on Steel and Convergent Spray Technology NASA AP2 Office projects. The first step in preparing the JTPs – identifying the project stakeholders' technical requirements – is currently being performed for Aliphatic Isocyanate Urethane Replacement on Structural Steel and Low-Emission Depainting on Steel NASA AP2 Office projects. Obtaining stakeholders' technical requirements has not been an easy process. NASA Centers involved in the JTP process have been unresponsive to emails requesting technical requirements. Project development activities have been slowed dramatically by the lack of responsiveness by the NASA Centers.

Mr. Rothgeb is awaiting information to be included in the draft JTP for Convergent Spray Technology migration to MAF. Project development efforts with MAF will be greatly slowed due to the return to flight activities currently under way. It may become extremely difficult to continue timely correspondence with MAF presently and in the near future. Mr. Preston Landry (MAF) and Mr. Phil Franklin (MSFC) have received action items to send previous qualification reports for the CST system and for SLA to the AP2 Office so the JTP can be started. On September 4th, Mr. Landry has submitted a report detailing the re-qualification of SLA. Mr. Franklin has not submitted SRB/CST qualification/implementation reports yet.

Mr. Andrews and Ms. Lewis is gathering data from the SEA Elements in support of the SEA Collaborative Study on Chromate Conversion Coatings. A JTP will be developed as data is received. Collecting the testing requirements from the SEA Elements has been slow, but discussions are scheduled for the SEA face-to-face meeting on October 8-9, 2003, which Mr. Andrews and Ms. Lewis will be attending.

For the Validation of Non-ODC Cleaning System for T-38 Aircraft and the Validation of Non-ODC Cleaning System for Gaseous O2 Carts JTPs will not be developed. These are Technology Transfer projects and do not require the development of JTPs.

c. Cost Benefit Analyses

Once feasible alternatives have been identified for each project, ITB plans to initiate work on the corresponding CBAs. Development of CBAs is currently being planned for the Aliphatic Isocyanate Urethane Replacement on Structural Steel, Low-Emission Depainting on Steel, and SEA Collaborative Study on Chrome Conversion Coatings projects. Completing CBAs within projected scheduling may be very difficult considering the difficulties that have been encountered while developing the PARs and JTPs. The goal is for the high-level CBAs to help identify potential financial impact(s) of implementing alternatives. The estimates in the high-level CBAs should not be used for any purpose other than determining the relative merits of the potential alternatives. The actual economic effects at any specific facility will depend on the alternative material or technology implemented, the number of actual applications converted, future workloads, and other factors.

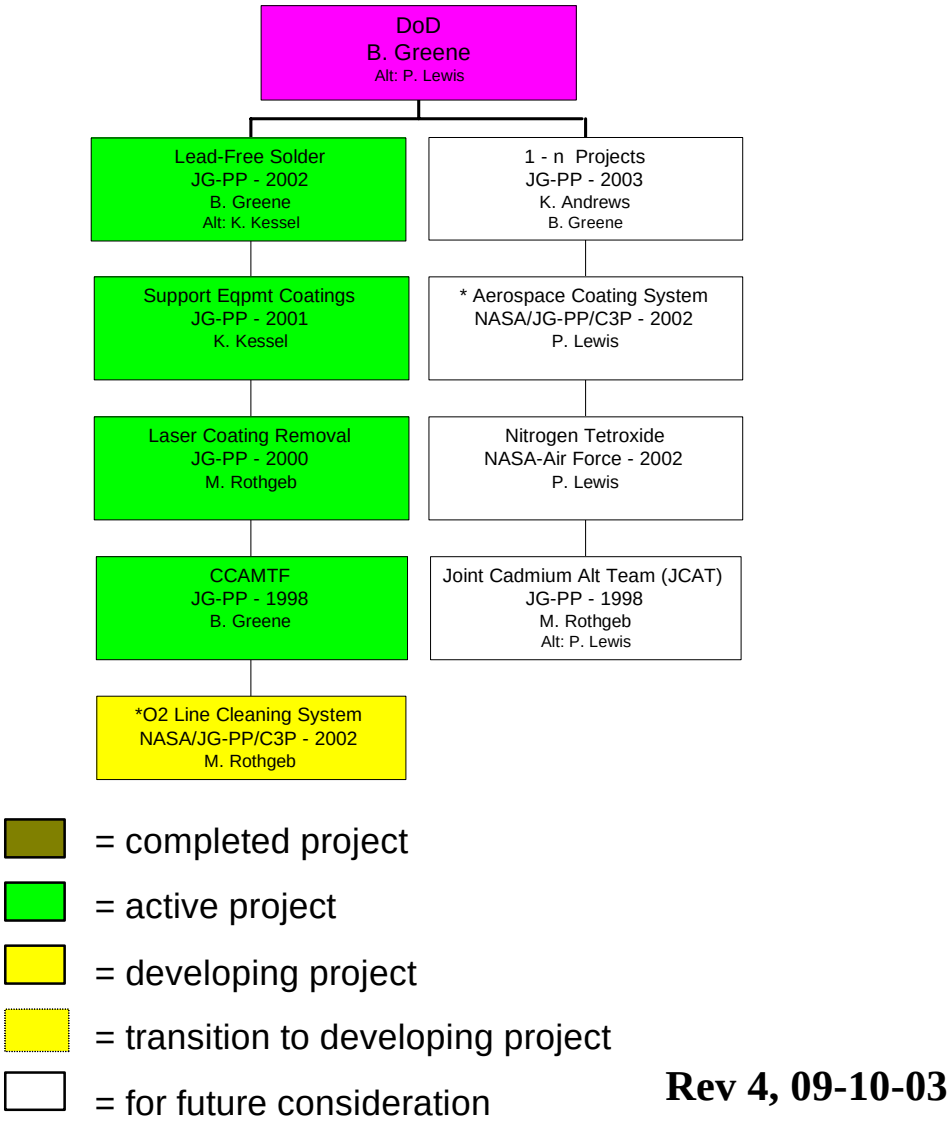
d. Joint Test Reports

Once testing completes on Agency AP2 projects, ITB will prepare Joint Test Reports (JTRs). The JTRs will detail the test results and provide analysis and conclusions.

C. DoD Business Entity Support

During the reporting period, ITB provided significant support to the JG-PP in its efforts to maintain environmental technology cooperation and qualify shared alternative material and process solutions that are less or non-hazardous to the environment. Some of this support involved identifying potential new projects and implementing earned value management, as discussed below. Figure 2 depicts the ITB engineering assignments to the nine (9) joint DoD/NASA projects that are active or under development.

Figure 2. NASA AP2 DoD Business Entity Opportunities/ITB Assignments



Rev 4, 09-10-03

1. JG-PP Working Group (JG-PP WG) Support

ITB regularly supports the JG-PP WG through participation in teleconferences, business and technical meetings, Principals' Meetings, and Joint Logistics Commanders (JLC) Meetings. ITB personnel have a wealth of experience and knowledge of JG-PP operations. This support contributes to JG-PP's continued success and drive for continuous improvement.

JG-PP WG Teleconferences: Ms. Hill noted throughout the period of performance that she, Mr. Hill, and Mr. Greene provided teleconference support. Where noted (e.g., in specific action item comments), ITB support was assigned lead responsibility for action item resolution.

07/22/03 JG-PP WG Telecomm:

JG-PP Metrics (4) Slides:

- Environmental Benefit and Economic Benefit, completed. Technology Transfer representative was not on telecomm to discuss. Project Earned Value, changes to slide completed by end of July. Slides completed by August 5 to insure JG-PP is not added to the JLC agenda.

JLC Action Item 1:

- WG to provide comment to first sentence of slide.

JLC Action Item 2:

- Include transfer of the LFS project to the Joint Council on Aging Aircraft (JCAA) and address what the services and labs are doing along with approximate amount of LS usage each service and NASA has. It was noted that JG-PP would assist the JCAA in managing the LFS project if requested to do so. It was further noted that LFS is not limited to aeronautical applications and could affect numerous defense systems.

JLC Action Item 3:

- No additional comments.

P2 Conference:

- Air Force requested booth support during the conference.

New Business:

- The WG decided it was not necessary to have an additional Principals' Meeting prior to October 1, 2003.

Status of open AIs relative to NASA:

- JWG.02.10.10: Information still being gathered by related action items.
- JWG.03.01.04: An updated was sent to the group on 07/21/03. The Business Plan was sent to JCAA for their concurrence. Revision of financial numbers continues as the ESTCP proposal continues.
- JWG.03.04.01: Ms. Hill distributed the updated CONOPS to the group on 07/21/03.

08/5/03 JG-PP WG Telecomm:

JLC AI Draft:

- Final comments to the JLC AI must be completed to prepare for the JLC Meeting in November. It was decided to brief the metrics during the Principals' Meeting. The objective of this meeting is to inform the Principals of what has been done and what direction JG-PP is going.

JG-PP Principal Chair Status:

- Mr. Gary Leitner informed the group that the Marine Corps would take the next chair rotation instead of the Army. Mr. Leitner plans to chair JG-PP similar to the Navy. Mr. deMonsabert, current chairperson, will draft a letter to each principal to inform him or her of the change in chairperson

New Business:

- An update status on the equipment sent to Point Mugu, CA, for the Low-VOC Identification Marking was requested.

- Mr. James will be manning the JG-PP booth for the Defense Manufacturers Conference in Washington, D.C. on December 1-4, 2003. He is requesting another person assist him with manning the booth. Mr. Patun supported the booth with Mr. James in 2002.

Status of open AIs relative to NASA:

- JWG.02.10.10: Comments received by NASA are being incorporated.

08/19/03 JG-PP WG Telecomm:

Comments on the JLC AI #1:

- Army received comments from the Navy and NASA. Navy to redistribute final JLC AIs to the WG to obtain concurrence from the JG-PP Principals.

Comments on the JLC AI #2:

- No final comments. Action completed.

Comments on the JLC AI #3:

- Comments have not been received for JLC AI #3. Each service was asked again to provide any comments to the one page word document.

JG-PP Principal Meeting Date:

- AF Principal may attend by video teleconferencing (VTCO).

Comments on Principals' Agenda:

- Agenda change: Mr. Terrell, Army, and Ms. Meredith, Air Force, will not be attending.
- NASA has provided the Working Group their presentation on EVM and is currently awaiting comments. Navy stated it would provide the Principal's presentation on the Environmental Metric by the end of the week to the Working Group for comments. Currently awaiting the AF's presentation on the Technology Transfer Metric, and the Army's presentation on the Economic Metric.
- All the Principal Action Items are planning to be closed at the Principals' meeting.

JG-PP Working Group Agenda:

- WG Meeting to be held on September 29-30. Agenda item to review the briefings to the Principals on 10/01/03.

Status of open AIs relative to NASA:

- Not all action items were discussed due to lack of time

09/2/03 JG-PP WG Telecomm:

This telecomm was cancelled

09/16/03 JG-PP WG Telecomm:

Comments on Results of Economic Discussion

- WG agreed with decision to use two Return on Investment (ROI) measurements

Final Comments on JLC AI's (ALL)

- No comments

JG-PP Principals' Meeting Agenda

- No Comments

List of Attendees for Principals' Meeting

- Updates being made

WG Meeting Agenda

- Due to number of agenda items submitted, only one day was required for the meeting
- Discussion of when the final draft of the CONOP will be submitted to the WG
- A two-hour block will be added to the agenda for discussion of Solvent Substitution projects

Project Selection Sub Working Group

- Two topics discussed at 09/12/03 telecomm: revised methodology (sent to WG on 09/15/03) and Solvent Substitution projects

Status of open AIs relative to NASA

- JWG.02.10.10: Assigned a 24-hour period for comment on the new methodology figure
- JWG.03.05.03: Closed—Complete Draft Metrics
- JWG.03.05.07: Discussion of Solvent Substitution projects to take place at WG face-to-face meeting on 09/30/03
- JWG.03.08.03: Point Magu, CA, all software has been loaded and equipment is working properly, awaiting training

09/30/032 JG-PP WG Telecomm

This meeting in Crystal City, VA, was supported by Mr. Hill and Ms. Hill. The primary objective of the meeting was to prepare for the 10/01/03 JG-PP Principles' Meeting. The following topics were discussed:

- Project Selection
- CONOP
- Principle AIs
- Package for JLC AIs

2. Shared Outreach Activities - Conferences

The following conference is a JG-PP supported conference in which NASA was the lead support. This means that the cost for registration, shipping the booth to and from CTC, Johnstown, PA (where the booth is housed), exhibit space, decorations, etc. come from JG-PP Core funds.

The Seventh Joint DoD/FAA/NASA Conference on Aging Aircraft
September 8-11, 2003
Hyatt Regency New Orleans
New Orleans, LA

JG-PP Booth Logistics and Security:

Ms. Hill coordinated with Ms. Gina Hudak, Conference Coordinator, CTC, the booth logistics, security, and badges for Ms. Brown, Mr. Greene, and Mr. Kessel on the following dates: 08/13/03, 08/15/03, 09/02-04/03.

JG-PP Booth Handouts:

Ms. Hill requested from a Technology Transfer Materials Checklist from Ms. Michele Farren, CTC. The list includes the types of JG-PP booth handouts: Tri-folds, pens, etc. On 09/02/03, Ms. Hill requested 15 boxes of pens and assorted tri-folds.

JG-PP Booth Exhibition:

Mr. Kessel assembled the JG-PP tabletop display on 09/08/03. When Mr. Kessel showed up at the Aging Aircraft exhibit hall located in the Hyatt Regency Hotel, the JG-PP booth space was empty—no booth. Mr. Kessel inquired about the empty booth location with the GES Exposition Services management representative who stated that JG-PP had not ordered anything for the booth. The GES Exposition Services management representative searched the files and did not have any of the booth registration paper work for JG-PP. Mr. Kessel contacted Ms. Hudak of CTC and explained the problem. Ms. Hudak faxed the booth registration paper work, including confirmation of acceptance for the original paperwork, to Mr. Kessel via the Hyatt Regency business center, at a cost of $1.00 per page. The basic booth provided by GES Exposition Services was finally set up at 1:45 p.m. with the exhibit hall to close at 2:00 p.m. The JG-PP tabletop exhibit was not delivered to the booth until 2:00 p.m., when the exhibit hall was scheduled to close. Fortunately, because the freight of

several other exhibitors was delivered late, GES kept the exhibit hall open past the scheduled exhibit set up time.

Once the JG-PP tabletop display was set up the new Lead-Free Solder panel created by CTC looked very good. (Mr. Greene had worked closely with CTC in the design of the poster, supplying all of the poster's graphics and text.) The new Lead-Free Solder panel fit well with the overall theme of the booth while proving a good explanation of the current project.

On the evening of Wednesday, September 10, Mr. Greene packed up the booth materials, placed the appropriate shipping labels on the boxes, notified Federal Express of the 10:00 a.m. pick-up time on Thursday morning, and handed in the GES material handling form, which included his cell phone number in case there was any problem. On Friday, 09/12/03, Mr. Greene received a fax at the NASA AP2 Office stating that FedEx did arrive at the Hyatt Regency Hotel at the proper time to pick up the JG-PP package. Since FedEx did not arrive, GES Exposition Services had to ship the JG-PP package out per their contracted shipping agent.

Mr. Kessel's and Mr. Greene's recommendations for the Aging Aircraft Conference are as follows:

1. Consider exhibiting the JG-PP booth at the Aging Aircraft Conference in the future.
2. Continue to try to reserve a booth location near the main social areas located within the exhibit hall.
3. Provide copies of the completed booth registration forms to the booth attendees before they depart for the conference.

Joint Services P2 and Hazardous Waste Management Conference
11-14 August 2003
Henry Gonzalez Convention Center
San Antonio, Texas

JG-PP Booth Support:

Ms. Hill and Mr. Hill staffed the JG-PP booth on 08/12/03 during the Ice Breaker Reception and during the break session on 08/13/03. They also assisted in tearing down the booth on 09/14/03.

The NASA AP2 office did not provide logistical support to this conference since the Air Force was previously identified as the lead.

3. Support JG-PP Projects

ITB provided technical support to the two key JG-PP projects noted below. ITB acted as the liaison to assure NASA requirements are being incorporated and to facilitate technology migration.

a. Coatings for Support Equipment

The NASA AP2 Office was informed on August 8, 2003, that the final report for the Low/No-VOC and Nonchromate Coating System for Support Equipment (Project Number: J-99-OC-014) project was under final review by Mr. Winston deMonsabert. ITB did not receive any announcement of a final project meeting to review the JTR or discuss implementation of the approved coatings. ITB reviewed the JTR and analyzed it for applicability to NASA and compatibility with NASA-STD-5008 even though the project manager never announced the

availability of the draft JTR before it was submitted to the JG-PP Government Project Manager for final review.

ITB will continue to track project activities and review the final JTR once released.

b. Portable Laser Coating Removal

A teleconference was scheduled for 07/01/03, but was cancelled. There is a face to face meeting scheduled for December 10th-12th, which Mr. Rothgeb will attend. Numerous Aluminum panels are being tested and several non-metallic panels. Boeing (NASA) supplied several non-metallic panels consisting of 14-ply graphite epoxy for testing. NASA's test panels were primed with 10PW22-2 or Super Koropon 515-K01A to a thickness of 3mils and no topcoat. The acceptance criteria for strip rates are based on requirement analysis or survey results and/or 0.06 ft^2 per minute at six (6) mils nominal thickness. Additionally some requirements that must be met include: no erosion observable at 10x magnification, no significant change in harness, no statistically significant degradation of tensile strength and no evidence resin erosion or fiber damage to the composite material. Results of these tests will be detailed during the face to face in December.

4. Coordinate JG-PP Projects

a. Lead-Free Solder

The major focus this reporting period was the setting up of subcontracts for the procurement of testing materials and the execution of mechanical shock and lead residue testing.

1) Technical Coordination

Mr. Greene and Mr. Kessel prepared for and facilitated five project technical teleconferences this reporting period: 07/07, 07/21, 08/13, 08/21 and 09/22. The following decisions were made at these teleconferences:

Testing Materials:

Components. Pre-tin the gold-finished hybrids.

Solder Fluxes. Use only low-residue (e.g. rosin-type, 6-10% solids) fluxes for all the lead-free solder alloys. Generally, try to stay away from RA fluxes because of the residue they can leave behind and their potential affect on Class 3.

Test Board Design. Additional space will be provided along two edges of the test board to accommodate the placement of “wedge locks” for mechanical shock and vibration testing. In addition, the location of certain components on the board continues to be revisited.

Test Procedures:

Rework. Boeing-Irving proposed numbers of components to rework. Boeing-Irving will determine exactly which ones on the board to rework.

Pb-Free Residue Test. Boeing-Phantom Works proposed numbers of components to analyze.

Thermal Cycle, dwell time. Propose a 15-minute dwell time (vs. 10-minute dwell time currently in the JTP). Rationale: More likely to differentiate any difference between Pb and Pb-free soldered boards. No affect on schedule; extra time already built in. In fact, may actually shorten testing time.

Testing Locations:

Cross-sectioning. Sandia Labs offered to cross-section one or two of the assembled test boards and take measurements as part of their in-kind contribution to the project.

Electrochemical Migration Resistance Test. Boeing-Anaheim offered to perform the EMR test as one of their in-kind contributions.

JG-PP Documents:

Joint Test Protocol. Updated the JTP to include the following changes:

- JTP Section 2.1.1.2, Table 2. Test Vehicle Matrix for Manufactured PWAs: Changed "GF" to read "FR4"
- JTP Section 2.1.2.2, Table 3. Test Vehicle Matrix for Reworked PWAs: Correctly changed "GF" to read "FR4"
- JTP Section 2.3, Figure 1. Common Test Flow Diagram for Manufactured Test Boards and Figure 2. Common Test Flow Diagram for Rework Test Boards: Transposed the 'Yes' (Y) and 'No' (N) in the last decision block so it reads correctly
- JTP Section 2.4, Figure 3. Extended Test Flow Diagram for Manufactured Test Boards: Correctly changed the number of IPC boards from 35 to 45 to account for actual number needed for testing.
- JTP Section 3.3.3, Surface Insulation Resistance: Correctly changed the number of IPC boards from 35 to 45 to account for actual number needed for testing.
- JTP Section 3.3.4, Electrochemical Migration Resistance Test: Correctly changed the number of IPC boards from 35 to 45 to account for actual number needed for testing.
- Preface: Corrected some organizational names based on comments from technical representatives.

Potential Alternatives Report. CTC updated some sections of the PAR to tell a more complete picture of how the lead-free solders were chosen and to include data on the SnCu(+Ni) wave solder alloys.

ITB updated the JTP (dated June 20, 2003) to include the changes noted in the discussion above and saw to its approval (by Air Force) and posting on the JG-PP Web site (by CTC) on August 6. According to CTC's Web statistics, the Lead-Free Solder Web pages, and in particular the solder JTP, is one of the more frequently visited pages on the JG-PP Web site.

On 08/15/03, Mr. Greene provided generally positive comment to the Air Force on CTC's revised Lead-Free Solder Potential Alternatives Report.

As noted above, one development this reporting period was offers received by Sandia Laboratory, Boeing-Anaheim, and Florida CirTech (a solder supplier) to donate time and/or materials to the project as their in-kind contribution:

- Sandia - Volunteered to conduct the board cross sectioning. Estimated value: $3,000.
- Boeing-Anaheim - Volunteered to conduct electrochemical migration resistance testing and purchase the test coupons. Estimated value: $4,000.
- Florida CirTech - Donated solders to the project. Estimated value: $18,000.

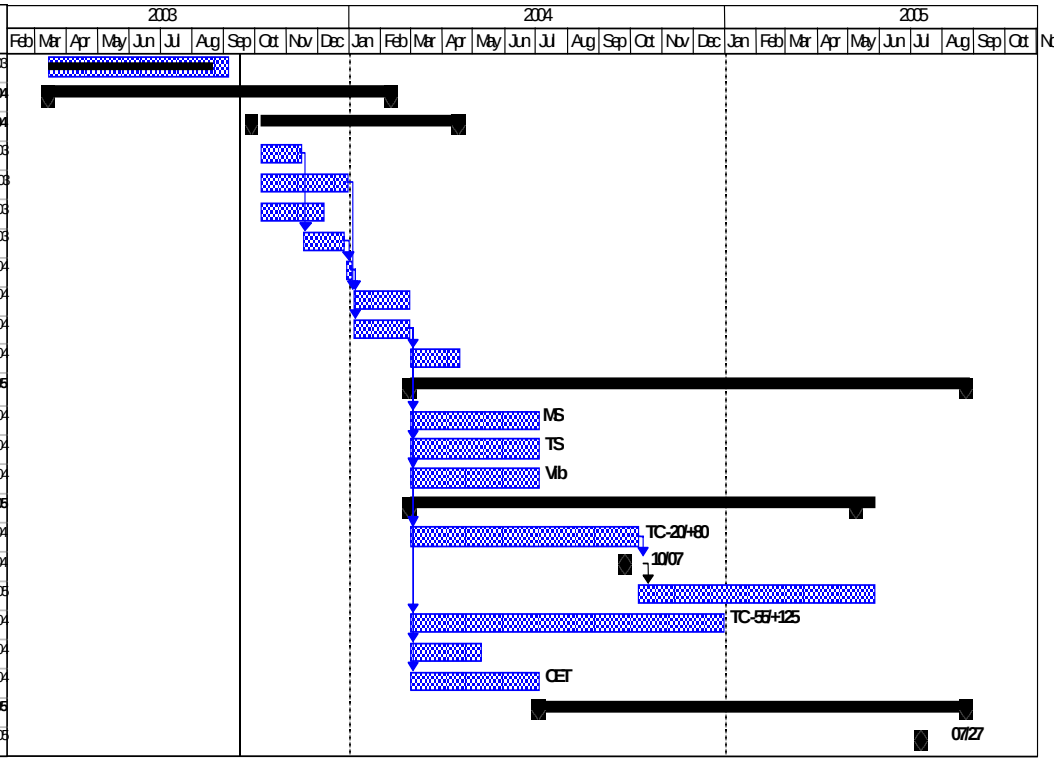
To date, over $350K in in-kind offers have been received from OEMs and other team members, assumed to be among the highest donations of any JG-PP project past or present.

Mr. Kessel and Mr. Greene continued to update the project schedule (in MS Project) throughout the reporting period. The project schedule was updated to accommodate several issues:

(1) In August, Mr. Greene discovered an error by the stakeholders in the predicted time to complete thermal cycling;
(2) The need to obtain an additional quote from another bidder (ACI) to perform the Mechanical Shock and Lead Residue testing;
(3) The discovery that most labs will not be able to begin testing until at least a month after money is received; and
(4) In September, it was obvious that it was going to take NASA Contracts longer than expected to approve ITB's proposal.

Because of these issues, the start of testing is now projected to begin two months later than predicted (in last quarter's (April-June 2003) Status Report). In addition, the revised schedule now correctly shows thermal cycle testing going until May 2005, with the final JTR being completed in August 2005 (eight months later than predicted earlier). Below is the latest project schedule as of September 22, 2003.

Task Name	Start	Finish
Joint Test Protocol (JTP) Approval	Fri 09/14/03	Thu 09/04/03
Business Phase	Fri 09/14/03	Wed 02/11/04
Testing Preparation	Mon 10/06/03	Fri 04/16/04
Order components (Collins)	Mon 10/06/03	Fri 11/14/03
Tin LCCC20 & Hybrid component leads (Collins; Corfin)	Mon 10/06/03	Mon 12/29/03
Components received and characterized (Collins)	Mon 10/06/03	Fri 12/05/03
Order test vehicles and solders (Collins)	Mon 11/17/03	Fri 12/26/03
Characterize bare boards (Collins)	Mon 12/29/03	Fri 01/02/04
Build PWAs; Rework PWAs (Boeing-Irving)	Mon 01/05/04	Fri 02/27/04
Test vehicle characterization (Collins)	Mon 01/05/04	Fri 02/27/04
Test vehicle cross-sectioning (Sandia)	Mon 03/01/04	Fri 04/16/04
Testing Phase	Mon 03/01/04	Fri 08/26/05
Mechanical Shock & Pb Residue (ACI)	Mon 03/01/04	Fri 07/02/04
Thermal Shock (tenta. Boeing PW)	Mon 03/01/04	Fri 07/02/04
Vibration (tenta. Boeing PW)	Mon 03/01/04	Fri 07/02/04
Thermal Cycle -20/+80C (Boeing PW)	Mon 03/01/04	Wed 05/25/05
5,000 Thermal Cycles	Mon 03/01/04	Thu 10/07/04
Mtg. - Prelim Data Review	Thu 10/07/04	Thu 10/07/04
Remaining Cycles (# cycles TBD)	Fri 10/08/04	Wed 05/25/05
Thermal Cycle -55/+125C (Collins)	Mon 03/01/04	Wed 12/29/04
Extended Tests (location TBD)	Mon 03/01/04	Fri 05/07/04
Combined Environments Testing (Raytheon, TX)	Mon 03/01/04	Fri 07/02/04
Joint Test Report	Mon 07/05/04	Fri 08/26/05
Mtg. - Project close-out	Wed 07/27/05	Wed 07/27/05



Mr. Greene and Mr. Kessel began preparing agendas for upcoming project teleconferences on October 3 and October 16, 2003.

2) Business Coordination

Mr. Kessel and Mr. Greene provided background assistance to ITB Headquarters in getting Rockwell Collins and American Competitiveness Institute (ACI) under contract

for material procurement and testing (mechanical shock and Pb residue tests), respectively. These activities included:

- Addressing frequent technical comments and questions from Rockwell Collins, Boeing, and ACI on the details of the test materials and relevant test procedures;
- Reviewing and revising (as necessary) copies of the Statements of Work;
- Tracking progress of the quotes that Collins, Boeing and ACI were to provide;
- Reviewing the technical portion of the quotes for accuracy;
- Communicating concerns (to Boeing) about the terms and conditions of their quote; and
- Soliciting from key team members their opinions on using ACI over Boeing for Mechanical Shock testing.

From mid July to early August, Mr. Greene and Mr. Kessel supported the Air Force by reviewing and commenting on two separate drafts of the Air Force's written proposal to ESTCP. Mr. Greene also coordinated the collection of resumes and financial data for inclusion in the proposal. Over 30 e-mail messages were sent to the Air Force over a 5-week period in responding to the proposal needs.

On August 19, 20 and 26, Mr. Greene provided comment on the Air Force's draft PowerPoint slides to brief to the ESTCP in September.

On 08/21/03, Mr. Hill, Mr. Greene, and Mr. Kessel met with the NASA AP2 Manager and MSgt Richard Hricko, Government Manager (U.S. Air Force Aeronautical Enterprise Program (AEP) Office) for the Lead-Free Solder project. Discussion topics included: current project activities, funding expectations, project management roles, and C3P. NASA reported that NASA would be awarding the ITB proposal shortly for executing the purchase of testing materials and mechanical shock and lead residue testing. MSgt Hricko reported that he had over $400K of Air Force funds set aside for Lead-Free Solder testing in 2004. Mr. Greene reported that the $400K should cover the remaining tests, assuming (a) that Raytheon can perform the Combined Environments Test in-kind, and (b) any cost increases are limited to a few percent. Once ITB is on contract to support the Air Force AEP Office, NASA AP2 can then begin transitioning some project coordination duties to the Air Force. Mr. Greene took action to send to MSgt Hricko (a) a revised testing cost summary table incorporating the adjustments agreed to at the August 21 meeting, and (b) a list of project duties to consider transitioning to the Air Force. Mr. Greene completed these actions via e-mail on 08/26/03. He reported that the total remaining DoD (non-NASA) funds needed to complete the testing is $395K (realistic case) to $465K (reasonable worst case; assuming about 15% contingency). Mr. Greene also reported examples of 20 activities that might transition well from NASA to the Air Force in FY2004, such as:

- Assist Mr. Greene in face-to-face meetings and teleconferences with stakeholders to resolve technical matters. This usually involves first working with stakeholders offline or in small-group conference calls to resolve issues in a timely manner. Specific offline activities may include contacting key stakeholders to get their opinions on an issue before a large-group telecomm to make an informed recommendation to the team at large.
- Assist Mr. Greene in managing the flow of testing through testing laboratories, including data reporting.
- Be a primary point of contact for collecting all test data.
- Be the primary author of the Joint Test Report/ESTCP final report deliverable. Work with team members to analyze the data and prepare conclusions in preparation for releasing the first draft of the JTR.

- Be a technical resource to the Air Force and JG-PP concerning the test program, including addressing JG-PP Working Group member action items or other inquiries related to the project.
- Maintain MS Project schedule based on input from Mr. Greene or other team members. Involves working knowledge of Microsoft Project 2003.
- Serve as liaison between OEMs and Air Force Aeronautical Enterprise Office to obtain [updated/official] quotes for testing and select which OEM will perform each test.
- Handle administrative details of meetings.

On 08/28/03, Mr. Greene e-mailed to the NASA AP2 Manager a list of value-added benefits of NASA's investment of time and manpower in the JCAA/JG-PP Lead-Free Solder project. A 3.5-to-1 return on investment was estimated for NASA's contribution. This figure is based on the assumption that NASA is getting $1.2M worth of testing, data analysis and reporting for a $350K direct investment in testing. The same 3.5-to-1 benefit ratio also holds if one looks at NASA's investment over the entire life of the project, including JTP, PAR & CBA development. For NASA to have developed a JTP, PAR, CBA, conduct the testing, and write the JTR, it would cost NASA about $1.9M; ITB forecasts NASA's total project-life investment will be $525K [$350K testing subcontracts + $175K labor from tech reps and ITB]).

In July 2003, Mr. Kessel and Mr. Greene reviewed the LFS project web pages and provided comments to CTC as to the content of the pages. The contractor will continue to monitor the information on the LFS pages on a periodic basis to ensure that it is current and accurate.

Mr. Greene briefed the LFS project at the Surface Mount Technology Association (SMTA) Conference in Chicago, IL on 09/23-26/03. The presentation was well received by the audience and resulted in increased exposure of the project to the electronics technical community.

5. Evaluate 15 New JG-PP Projects

The goals for this reporting period were (a) to finalize project selection criteria and methodology, and (b) assist JG-PP in initiating project development to the top 17 candidate project areas identified as scoring a 3.0 or above.

In mid-2003, as a “test” of the newly revised JG-PP methodology, the NASA AP2 Office began analyzing the P2 needs submitted by the services. The result was the development of a list of multi-Service P2 needs ranked on a scale of importance of 1 to 5.

Mr. Andrews currently serves as the NASA AP2 representative and an active member of the "Project Selection" subcommittee. The purpose of the subcommittee is to provide a down-selection from the 17 highest priority technology needs that were identified in the 1-n listing and ranked by the services and NASA. The goal of the subcommittee is to review those needs that have a ranking of 3.0 or greater and down select to a final listing of projects for FY 04 and 05. The subcommittee members are:

- Mr. Andrews, NASA;
- Mr. Del Collo, Navy;
- Ms. Giardina, Army;
- Mr. Russell, Marines;
- Ms. Willis, Air Force; and
- Mr. Patun, CTC.

To achieve its goals the subcommittee must:

- Review the various draft Selection Criteria and agree on final criteria;

- Discuss the timeline for project selection;
- Discuss ESTCP/SERDP coordination and timeline for proposal submittal;
- Review draft SOW for addressing the existing high priority needs with a ranking of 3.0 or greater; and
- Down-select projects that are congruent with the 1-n listing of needs.

On 09/18/03, Mr. Greene sent a five-page e-mail to the NASA AP2 Manager providing background material on the JG-PP project selection, along with some concerns about CTC's proposal of a cleaning JTP as the next JG-PP project. Mr. Greene's observations of the JG-PP project selection process included the following:

1. There seemed--and still seems--to be disagreement among the WG members on the sense of urgency of developing new projects for a FY2004 start.
2. When project selection began to be discussed at WG meetings, the discussions and ensuing actions were not clearly stated in WG meeting minutes.
3. The project selection Sub-committee members appeared to ignore the current JG-PP project selection process and selection criteria.
4. The Sub-committee members did not formally communicate to the WG members (e.g., via agenda item on a WG telecomm) their concern with not being able to meet the Aug 15, 2003 deadline for recommending new projects.
5. Most of the services--still to this day--have not distributed to the WG any discrete project ideas (NASA and Air Force are the exceptions).
6. Precious time was simply wasted.
7. Some of the WG members and their contractors are ill informed about the tools JG-PP already has available.
8. JG-PP has never defined (on paper) what constitutes a "project", let alone a "good" JG-PP project.
9. The WG and contractors need to accept the new Phase VII in the JG-PP methodology (Evaluation/Feedback), as proposed by NASA.

ITB also has concerns with the Sub-committee's attempt to select "cleaning" as the next JG-PP project. In general, there is not enough information for NASA AP2 office to make a decision on the viability of such a cleaning project. Second, the idea does not appear to meet the conventional definition of a project. In addition, selecting such a cleaning project presupposes that because cleaning is a good general P2 opportunity area that any idea for a specific cleaning project must also be good. Right now, there is not a clear enough project objective or constraints on its scope of the proposed cleaning project to ensure that the cost and schedule won't grow out of proportion. In summary, ITB feels that the individual WG members should be making every effort to solicit ideas for well-defined projects from within their respective services and funneling up the best ideas for WG consideration.

6. JG-PP Financial Management Tools

Mr. Greene and Ms. Lewis supported JG-PP Working Group action items to develop earned value metrics for future JG-PP projects. PowerPoint slides discussing the earned value approach and how to implement it within JG-PP were prepared by ITB and submitted to the Working Group for presentation at the October 2003 JG-PP Principals Meeting. Mr. Hill incorporated the metrics into the Concept of Operations (CONOP) for distribution to the WG.

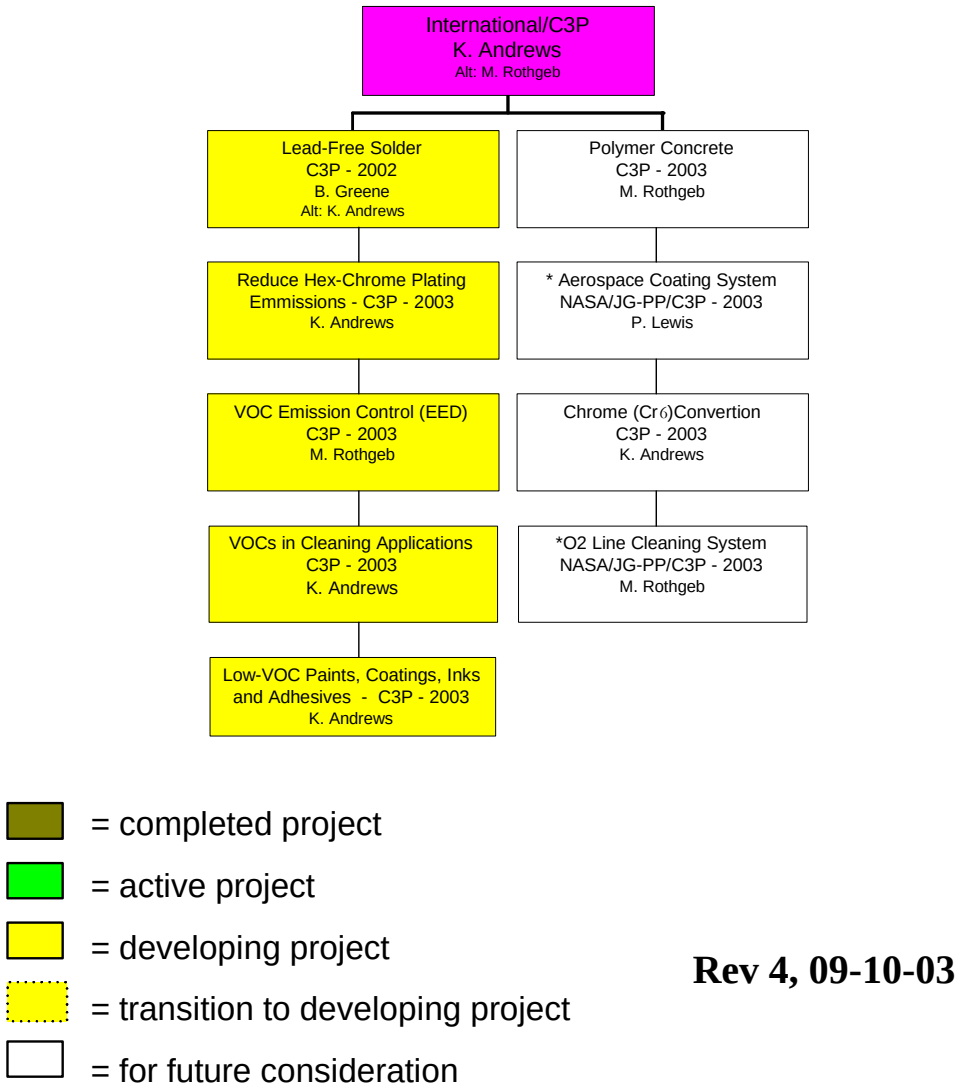
Ms. Hill monitored the JG-PP Program and Project financial funding workbooks and recommended changes were applicable to NASA interests.

D. International Business Entity Support

During the reporting period, ITB supported the Portuguese Institute of Environment and Centro Para Prevenção da Poluição – C3P (English translation: Center for Pollution Prevention) under the NASA/Portugal Joint Statement (JS) and the Terms of Reference (TOR). C3P is the AP2 counterpart organization in Portugal. Figure 3 depicts the ITB engineering assignments to the nine (9) joint NASA/International projects that are active or under development.

Figure 3. NASA AP2 International

Business Entity Opportunities/ITB Assignments



Rev 4, 09-10-03

1. Program Support

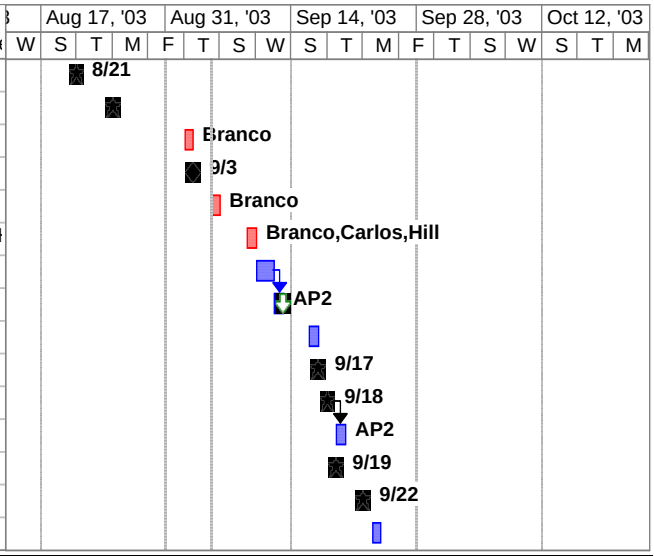
A meeting was held on 07/08/03 with Mr. Carlos Caldas, Mr. Hill, Ms. Hill, Mr. Greene, Mr. Andrews, and Mr. Rothgeb to review the following actions for the C3P/NASA Workshop and Joint Oversight Group (JOG) meetings: Invitation Letters, Develop Milestones, Draft Tri-fold, Agendas, Meeting Planner, Distribution List, Workshop Registration.

On 07/09/03, it was decided the title for the C3P/NASA Technical Workshop would be "Integrating Common Problems for Shared Solutions."

On 07/18/03, Ms. Hill prepared final draft invitation letters for Ms. Brown and General Pelágio Branco, C3P.

Below is the latest schedule:

ID	Task Name	Start	Finish	Resource Name
1	C3P/NASA Telecon	Thu 8/21	Thu 8/21	C3P/AP2
2	Telecon: Carlos, Chris, E	Mon 8/25	Mon 8/25	
3	Action Due from Branco	Tue 9/2	Tue 9/2	Branco
4	Meeting with Chris	Wed 9/3	Wed 9/3	AP2
5	Abstracts Due	Fri 9/5/	Fri 9/5/	Branco
6	Workshop/JOG Briefings	Tue 9/9	Tue 9/9	Branco,Carlos,H
7	OGMA Assessment	Wed 9/10	Thu 9/11	
8	TAP Assessment	Fri 9/12	Fri 9/12	AP2
9	C3P Internal Face-to-fac	Tue 9/16	Tue 9/16	
10	OGMA & TAP Site Visit	Wed 9/17	Wed 9/17	NASA,etc.
11	Protocol Signing	Thu 9/18	Thu 9/18	
12	NASA Tower Set-up	Fri 9/19	Fri 9/19	AP2
13	Workshop	Fri 9/19	Fri 9/19	All
14	JOG Meeting	Mon 9/22	Mon 9/22	
15	Follow-On Meeting	Tue 9/23	Tue 9/23	



2. Administrative Support

The NASA AP2 office supported the C3P technical workshop titled "Integrating Common Problems for Shared Solutions" and JOG meeting in Lisbon, Portugal, on September 19th and 22nd respectively. In this effort, the AP2 Office provided managerial, technical and administrative support that included but is not limited to:

Thank You Letters:

Mr. Hill prepared letters for TAP, OGMA, and all-purpose distribution on 07/25/03 as a result of the Assessment visits to accompany the Assessment Report and to invite attendance to the C3P/NASA Technical Workshop. Ms. Hill worked logistics for NASA review and the approval system for signature. The letters were sent by email and certified mail to General Branco on 08/01/03. The objective for this task was to thank the entities for the recent site visits.

Workshop and JOG Meeting Timeline Management:

Mr. Hill continued to track and manage the schedule of events developed in MS Project 2000 for the planned Technical Workshop scheduled for Sept 19th and the JOG Meeting scheduled for Sept 22nd. In this process, Mr. Hill maintained coordination between NASA and the C3P

regarding all event requirements.

C3P/NASA Agenda:

Mr. Hill developed the agenda topics for the Technical Workshop and coordinated the agenda's acceptance with Ms Brown, General Branco, and Mr. Caldas. Ms. Hill completed the editorial and formatting requirements for the agenda and had it posted on the C3P website. A copy of the agenda is attachment 1 to this report.

C3P/NASA Technical Workshop Tri-Fold:

Ms. Hill reworked the Tri-fold format and syntax on 08/01/03, 08/03/03 and 08/04/03. The final version was provided to Ms. Brown, General Branco, Mr. Caldas, Mr. Andrews and Mr. Hill on 08/27/03. The Tri-Fold was used at the Workshop in conjunction with the agenda.

C3P/NASA Technical Workshop Invitation Letters:

On 07/18/03, Ms. Hill prepared final invitation letters for Ms. Brown and General Branco, C3P, to send to the EU and US invitees. The invitations were sent to US invitees by email on 07/24/03.

NASA Tower and Panels:

On 07/31/03, 08/19/03, 08/20/03, 08/21/03, 08/25/03 and 08/22/03, Ms. Hill worked with Ms. Brown on the panels for the NASA tower to be displayed at the workshop.

On 08/27/03, Mr. Andrews and Ms. Hill received training in constructing and dismantling the tower. On 08/29/03, the tower and panels were shipped by NASA to Ms. Cristina Rodrigues, ISQ, Porto Salvo, Portugal. As per General Branco's email on 08/22/03, Ms. Rodrigues was identified as the point of contact for this effort.

On 9/16/03, Mr. Hill assisted with the coordination, receipt, and inspection of the NASA Tower at the Institute of Superior Technology. On 09/18/03, Mr. Andrews and Ms. Hill assembled the NASA Tower with Ms. Brown. On 09/22/03, Mr. Andrews and Mr. Rothgeb disassembled the NASA Tower and coordinated its pick-up and shipment back to NASA KSC.

C3P/NASA Technical Workshop Registration List:

On 07/25/03, Ms. Hill requested from Mr. Caldas a dedicated ITB email address to support the workshop registration. The address is c3p@c3p.org. Ms. Hill monitored the registration site and submitted updates to Ms. Brown, General Branco, Mr. Caldas, Mr. Andrews and Mr. Hill on the following dates: 08/08/03, 08/18/03, 08/20/03, 08/26/03, 09/03/03, 09/10/03.

C3P/NASA Technical Workshop Hotel Accommodations:

Hotel accommodations for U.S. attendees were made by Mr. Hill. Guests stayed at the Lisbon Marriott Hotel, Lisbon, Portugal. As of 09/10/03, the list held 20 hotel registrations.

Developing Briefings and Presenting for the C3P/NASA Technical Workshop:

Mr. Hill coordinated the development, timing and submittal of all abstracts and briefing presentations for the C3P/NASATechnical Workshop.

- History/Program Overview: Mr. Hill.
- Identification of Low VOC substitutes to chemical used in Portuguese SME's: Mr. Andrews.
- Cleaning of Oxygen Line systems: Mr. Hill.

- Chemical Product Regulations Impact in Transatlantic Relations: Dr Andrews, BAE and Ms. Dominguez, NASA HQs.
- Volatile Organic Compounds (VOCs) Emission Control--Control release until low VOC materials/processes are qualified: Mr. Andrews and Mr. Rothgeb.
- Reduction/elimination of VOCs (MEK, MIBK, TEC, etc.) in cleaning applications: Mr. Andrews.
- Identification, Demonstration and Validation: Low/no-VOC paints, coatings, inks, and adhesives; - Mr. K. Andrews
- Reduction/elimination of emissions: Hexavalent-chrome (Cr^6) plating baths: Mr. Rothgeb.
- Lead-Free Solder: Mr. Hill.
- Project Area Overview: Technology Migrations Opportunities--Low/No VOC Coatings (Powder Paint, Non-Chrome Primers, and Labeling System for No VOC Marking): Mr. Hill.
- Program/Project Process Review: Mr. Hill.

Joint Oversight Group (JOG) Agenda:

Mr. Hill developed the agenda topics for the JOG Meeting and coordinated the agenda's acceptance with Ms Brown, General Branco, and Mr. Caldas. JOG agenda is attachment 2 to this report.

3. Identify International Needs

Needs assessments were completed at twenty-four (24) government, military, and commercial manufacturing and maintenance facilities in Portugal. The objective was to evaluate industrial processes for existing HazMat and volatile organic compound (VOC) uses, identify technologies or processes that could be used to meet European Union (EU) and Portuguese legislative limit requirements, and determine project areas that could yield benefits to both Portugal and NASA in reduction or elimination of HazMats and VOCs.

The Assessment Team's single dominant assessment conclusion is that the majority of sites visited are not fully prepared for the passing of Portuguese environmental legislation DLn^o 242/2001 VOC emission levels because of many limiting mechanisms. The Assessment Team determined that to meet the challenges of EU and Portuguese reductions in VOC emissions and HazMat uses requires a combination of economic and integrated technology efforts in best management practices, control technologies, and the identification and validation of alternative materials.

The Assessment Team included the following individuals:

Kevin Andrews	NASA AP2
Matthew Rothgeb	NASA AP2
P. Castelo Branco	C3P
Joaquim F. Silva Gomes	INEGI
Antonio Castro Vide	INEGI
Sonia Ferreira	INEGI
Rui Neto	INEGI
Isabel E. Mendes	ISQ
Ana Claudia Casinhas Coelho	ISQ

Assessment findings are found in section 5. Coordinate C3P Projects. Each assessment project area was then considered for presentation at the C3P/NASA Technical Workshop.

As a result of the Technical Workshop, three (3) specific project areas were identified:

1. VOC emission abatement, to include emission control and clean technology

demonstrations;
2. Polymer concrete for facility applications; and
3. Demonstration of Lead-Free solders.

The goal during the next reporting period is to finalize specific project opportunities. ITB will continue to outline project schedules and liaise with C3P equivalents on technical issues of NASA AP2 interest. As cited by Ms. Dominguez and confirmed by Ms Brown during the JOG meeting, NASA support is to continue to provide guidance and mentorship in the project definition phase and in preparation and review of the project test protocols.

4. Prepare C3P Letters of Agreement

No C3P project letters of agreement were accomplished during this reporting period.

5. Coordinate C3P Projects

Engineers Mr. Andrews and Mr. Rothgeb completed environmental technology needs assessments at twenty-four (24) government, military, and commercial manufacturing and maintenance facilities in Lisbon and Porto, Portugal from June 19 - July 2, 2003. The objective was to evaluate industrial processes for existing HazMat and VOC uses, identify technologies or processes that could be used to meet European Union (EU) and Portuguese legislative limit requirements, and determine project areas that could yield benefits to both Portugal and NASA in reduction or elimination of HazMats and VOCs. The NASA AP2 office submitted an assessment report with contributions by Mr. Hill and Ms. Lewis. The report was submitted on behalf of NASA and the Centro Para Prevenção da Poluição (C3P) and identified common P2 opportunities in Portugal of potential NASA interest.

The Assessment Team determined that to meet the challenges of EU and Portuguese reductions in VOC emissions and HazMat uses requires a combination of economic and integrated technology efforts in best management practices, control technologies, and the identification and validation of alternative materials.

The Assessment Team recommended that C3P:

1. Continue with joint project identification & development in the following areas:

   - VOC emission control–control release until low VOC materials/processes are qualified;
   - Reduction/elimination of VOCs and HazMats in cleaning applications;
   - Reduction/elimination of emissions from hexavalent-chrome (Cr^6) plating baths; and
   - Identification, demonstration and validation of low/no-VOC paints, coatings, inks and adhesives.

2. Continue to evaluate environmental technology migration opportunities between Portuguese and NASA applications in the following areas:

   - Demonstration and validation of suitable alternatives to hexavalent-chrome (Cr^6) in metal surface finishing conversion coatings and primer coatings;
   - VOC and HazMat free technologies for depainting on aluminum and composite substrates;
   - Demonstration and validation of alternatives to cadmium plating for aircraft components;
   - Non-trichloroethylene (TCE) oxygen line cleaning systems;
   - Reduction/elimination of VOCs from ink/paint stenciling and marking; and
   - Lead-free solder.

3. Continue efforts to build a network to share best management practices and exchange information between Government and industry partners.

4. Continue efforts to identify emerging technologies that address current national P2 interests:

    - Identification/production of lead-free brass for domestic appliances; and
    - Polymer concretes using recycled aggregates.

Mr. Andrews was the keynote speaker at the Portuguese Workshop for Lead Free Soldering and Technologies for Electronics on July 2nd 2003. Mr. Andrews presented on behalf of Ms. Brown on "New Trends in Lead Free Soldering" and chronicled the JG-PP activities on Lead Free Solder as well as the future of the industry. Mr. Greene of the NASA AP2 office is currently managing this activity.

The NASA AP2 office also acted as liaison between BAE Systems, UK, and C3P and facilitated the signing of a protocol agreement between the two parties on September 18, 2003.

In support of NASA AP2's commitment to support the C3P program and mentor engineers and industry in Portugal, Engineer Andrews provided a brief presentation on the Plastic Media Blasting (PMB) to INEGI engineer Sónia Ferreira for transmission to Eng. Manuela Pereira of Salvador Caetano.

Mr. Andrews also inquired whether there were any Portuguese regulations equivalent to the National Emission Standards for Chromium Emissions from Hard and Decorative Chromium Electroplating and Chromium Anodizing Tanks (U.S. EPA, 1995 a).

In preparation for the C3P workshop, Mr. Andrews and Mr. Rothgeb conducted P2 Technical needs assessments of OGMA and TAP Air Portugal in September 2003 to review some of the technical concerns associated with embarking on a joint aerospace project and to define a way forward. Commensurate with the goal of the C3P workshop, Mr. Rothgeb and Mr. Andrews conducted additional facility visits in the north and south of Portugal with interested stakeholders to review project technical requirements.

6. C3P Financial Management Tools

C3P financial management tools were not accomplished during this reporting period, as no projects were mature enough to warrant financial support.

7. Migration of NASA & DoD Technologies to C3P

On 08/08/03, Mr. Rothgeb and Mr. Greene participated in a conference call with three representatives from Applied Membrane Technology concerning the viability of their membrane VOC removal technology for possible C3P projects. Mr. Rothgeb has been working with this project since 2002 determining where the technology may best be used to benefit both NASA and other stakeholders such as C3P. At Mr. Andrew's follow-up invitation, AMT representatives spoke about their membrane technology at the September C3P Workshop in Lisbon.

8. C3P Action Item Tracking Tool

Action item tracking was accomplished by Ms. Hill in support of the requirements for the Technical Workshop and JOG meetings.

9. C3P Information Management Systems

The C3P web site was maintained and updated during this reporting period by Ms. Carroll. The C3P and NASA Technical Workshop, "Integrating Common Problems for Shared Solutions," to be held September 19, 2003 in Lisbon, Portugal, agenda and registration pages were added to the web site in early July. Updates and changes were administered as needed to the agenda, registration, and calendar of events. Two new images received from both Ms. Brown and Mr. Caldas were incorporated into the web site. The contractor will continue to support updates to the C3P web site during the next reporting period under the direction of NASA Program Manager, Ms. Brown.

Home Page, Agenda, Registration, and Calendar:

Ms. Hill noted the home page was changed to support the workshop on 07/22/03. The changes included specific recommendations by Ms. Hill and specific direction given by Ms. Brown. The objective of the changes incorporated format, syntax, banner, hot buttons, and supporting links to the agenda and registration page.

Ms. Hill noted numerous changes and updates made to the agenda that included Topic and Presenter changes. Ms. Hill recommended the agenda be saved in PDF format. Ms. Carroll accomplished this on 09/04/03. Ms. Carroll distributed the final agenda to General Branco by Word Format on 09/09/03.

On 08/15/03, Ms. Hill provided information from General Branco for the registration page that included the Congressos, Viagens e Turismo (CVTravel), an IATA Travel Agency.

Conclusion

The NASA AP2 Program remains a very viable and active Agency Program. All ITB resources are fully employed in providing support to develop and maintain the current level of programmatic and project efforts across the three business entities. The ultimate success of each project remains subordinated to the level of strategic direction provided by NASA, the individual performance of the project integrator, and from the responsiveness of those identified as project stakeholders. The ITB project integrators will continue to identify the challenges and risks for maintaining the level of program and project activity being conducted to the NASA AP2 Program Manager for direction.

Attachment 1

C3P and NASA Technical Workshop Agenda

"Integrating Common Problems for Shared Solutions"

19 September 2003

Organized by C3P (Centro Para Prevenção da Poluição)
and
NASA (National Aeronautics and Space Administration)

Instituto Superior Técnico
Av. Rovisco Pais
Lisboa, Portugal

Workshop Objective:

- Develop common understanding of program philosophy, joint pollution prevention (P2) program guidance, tools, project development methodology, and expectations to accomplish common P2 projects with shared solutions.
- Hear presenters from government, industry, and small and medium enterprises (SMEs) regarding P2 needs.
- **Identify industrial project partners among United States, Portuguese, and European Union interests.**
- Finalize locations and plans for initiating formal P2 projects.

Time	Topic	Presenter
9:00-9:10 AM	**Welcome**	H.E. Minister for Cities, Territorial Planning, and Environment
9:10-10:00 AM	**History/Program Overview** ▪ Program expectations and inter-relationships ▪ Project methodology	Gen. Pelágio Castelo Branco, C3P and Dr. Robert Hill, NASA AP2
10:00-10:45 AM	**Chemical Product Regulations Impact in Transatlantic Relations Panel Session**	Dr. David Andrews, BAE and Dr. Olga Dominguez, NASA
10:45-11:00 AM	**Coffee-Break**	All
11:00-11:30 AM **11:30–12:00 AM** **12:00-12:30 PM**	**VOC's Panel:** **Project Area #1** Volatile Organic Compounds (VOCs) Emission Control: Control release until low VOC materials/processes are qualified. **Project Area #2** Reduction/elimination of VOCs (MEK, MIBK, TEC, etc.) in cleaning applications **Project Area #3** Identification, Demonstration and Validation: Low/no-VOC paints, coatings, inks, and adhesives.	Eng. João Gomes Eng. Sónia Ferreira and Eng. Matt Rothgeb, NASA AP2 Eng. Ana Claudia Casinhas Coelho and Dr. Kevin Andrews, NASA AP2 Eng. Marco Estrela and Dr. Kevin Andrews
12:30-2:00 PM	**Lunch**	All
2:00–2:30 PM	**Project Area #4** ▪ Reduction/elimination of emissions: Hexavalent-chrome (Cr^{6}) plating baths.	Eng. Sónia Ferreira and Eng. Matt Rothgeb
2:30-3:00 PM	**Project Area #5** ▪ Lead-Free Solder	Eng. Eduardo Lopes, ISQ and Dr. Robert Hill
3:00-3:20 PM	**Heavy Metals in Aerospace Processing – Successes and Challenges**	Dr. Robert Hill
3:20-4:10 PM	**Project Area Overview:** ▪ **Technology Migrations Opportunities:** **Low/No VOC Coatings** (Powder Paint, Non-Chrome Primers, and Labeling System for No VOC Marking) and **Oxygen Line Cleaning**	Dr. Robert Hill Dr. Jerry Strauss
4:10-4:30 PM	**Break**	All
4:30-4:50 PM	**Project Area #6** ▪ Lead-Free Copper-Zinc Alloys	Eng. Rui Neto, INEGI and Prof. Jorge Lino, INEGI
4:50-5:15 PM	**Project Area #7** ▪ Polymer Concretes	Prof. António Ferreira, INEGI
5:15–5:45 PM	**Program/Project Process Review and Actions/Next Steps**	Prof. J.Silva Gomes and Dr. Robert Hill
5:45–6:00 PM	**Workshop Summary and Closure**	President of Environment Institute

Joint Oversight Group Meeting Agenda

September 22, 2003
Rua de S. Domingos à Lapa, Nº 26
1200-835 Lisboa, Portugal

Objective

1. Review tenants of the Terms of Reference (TOR) regarding environmental matters, establishing the framework to develop environmental technology cooperation between the Parties, and identifying potential cooperative pollution prevention projects of benefit to the Participants in reducing hazardous material use.

2. Discuss programmatic and project elements for identifying other opportunities for collaboration to satisfy provisions of the TOR.

10:00-11:00 AM	A Year in Review Establishing the Framework • Established C3P CONOPs, Business Plan, Project Identification Process, and Project Implementation Plan Guide • NASA Provided Mentor programmatic, administrative, and project development support Project Development Process • Targeted Opportunities o Portuguese National Interests o NASA Interests • Project Assessment Survey • Conducted Site Assessment Visits • Conducted Technical Workshop Networking Organizations Engaged – Paris Air Show, OGMA, TAP Air, AECMA, EDIG, NIAG, other Portuguese Associations, etc. Signing of General Protocols – BAE Systems, TWI, and other Portuguese signatories	Mr. Carlos Caldas
11:00-11:30 AM	Near-Term Plans for 2004 Goals Begin 2 collaborative projects – reduce VOCs in emissions and coatings LIFE – status and expected benefits HISCA – status and expected benefits Business Strategy - Show planned resource allocations and contingency plans	Mr. Carlos Caldas
11:30 AM-12:00 PM	Long-Term Plans for 2005 – 2006 Goals Begin 4 collaborative projects Business Strategy - Show planned resource allocations and contingency plans	Mr. Carlos Caldas
12:00-12:20 PM	Executive Session	Ms. Dominguez Gen. Pelágio Branco President Environment Institute
12:20-12:40 PM	JOG Direction to Working Group Members	Et All
12:40-12:50 PM	Action Item Review	
12:50-1:00 PM	Closing Statement	
1:00 PM	Lunch	All